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VIEWS, NEWS AND INTERVIEWS.

"Sometimes I come across a fusible plug that is not quite long enough," said the engineer in charge of an isolated plant. "It will not make contact with the connecting strip in the bottom of the cut-out. In such a case I simply lay a copper cent in the hole and then screw in the plug. It works in great shape."

About one person in every 100,000 was struck by lightning in this country last year.

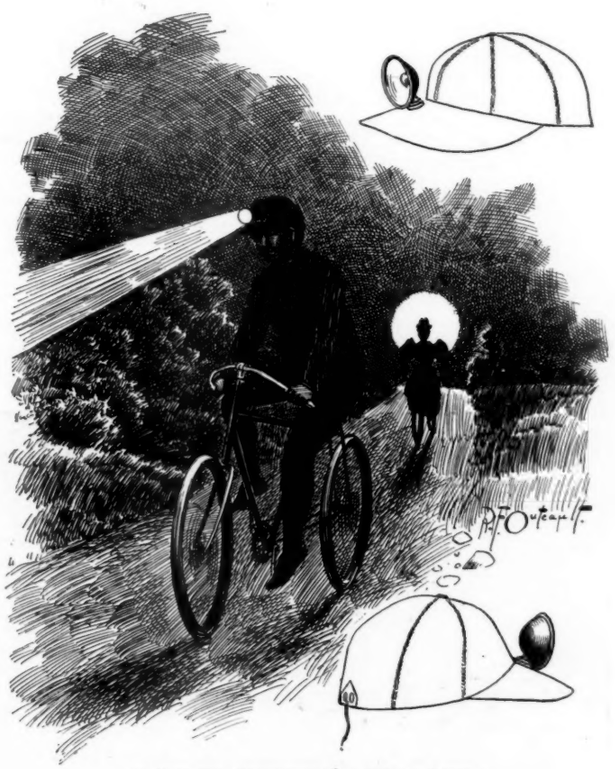
Baltimore has invented an attractive novelty for trolley car parties, says an exchange. Last week a party of 40, comprising a due proportion of gay youths and maidens properly chaperoned, started for a ride to Glyndon. On the return trip a member suddenly left his seat and had a long whispered consultation with the motorman, whose subject he refused to divulge to his curious companions, although, stimulated by the mischievous twinkle in his eye, they plied him with questions. On merrily went the car till, all at once, the motorman sung out:

"At the top of this hill, look out for the tunnel!"

The mystified members of the party looked at him and one another in amazement, for no tunnel could they remember on the road. But when the top of the hill was reached they shot into quick darkness, for the motorman had turned off the electric lights. A peal of laughter rose as the joke was seized, and then all over the car arose sounds of an osculatory nature which the perplexed chaperones could not locate, but were pacified when told the girls were only kissing their hands in deference to tunnel customs. Six tunnels were passed, and finally the motorman cried out:

"Last tunnel before we reach the city!" and the tunnels were unanimously voted the best part of the jolly ride.

Work on the foundation for the electrical engineering laboratory, which is to be an adjunct of Case School of Applied Sciences, at Cleveland, has been commenced and will be pushed to completion as rapidly as possible. It is the intention of the faculty to have the building ready for occupancy when school opens in the Fall. The laboratory will cost $25,000.



AN ELECTRIC HEADLIGHT FOR BICYCLE RIDERS.

An unusual accident happened to a boy in Newark, N. J., one evening last week. He was passing through Centre Market, and as he walked under one of the big electric arc lamps the globe slipped from its fastening and fell on him. It passed over his head and almost severed one of his ears. It broke on his shoulders, and he was badly cut about the neck and face.

The Westinghouse Electric and Manufacturing Company has begun the drilling of a well for natural gas on the land in front of its immense works at East Pittsburgh, and the novel experiment of using electricity for power will be made. An ordinary 25-horse-power railway motor is placed in the engine house, instead of a steam engine, and the current is supplied from the works. The experiment is understood to be under the special direction of Mr. George Westinghouse, who believes great economy in drilling wells will result in the use of electricity.

KIND WORDS.

GATHERED USEFUL HINTS.

TO THE EDITOR OF ELECTRICAL REVIEW:

I have gathered many useful hints from the pages of the ELECTRICAL REVIEW. J. B. P.

Asheville, N. C., July 2.

An Electric Headlight for Cyclers.

The illustrations herewith show an electric headlight for cyclers which has been invented by Messrs. E. D. Rockwell and A. M. Rodriguez, of Brooklyn, N. Y. A small storage battery of about eight-ampere hours capacity is carried on the bicycle or in the rider's pocket, and a body wire leads from it to the terminal points on the back of the cap. The lamp in front is detachable and weighs only about one and a half ounces. In this simple manner a true searchlight is obtained because the light is always focused in the same direction that the rider looks, and being on the visor of the cap the eyes are protected from the light, which illuminates the way most satisfactorily, and will undoubtedly add much to the safety, and, therefore, to the pleasure, of bicycle riding at night.

New York Subway Companies Dispute Their Taxes.

The Consolidated Telegraph and Electrical Subway Company has obtained a writ of certiorari to review its personal tax assessment for 1895. The company says that it has never earned nor declared a dividend, and is in default of interest on second mortgage bonds, but that it has been assessed on its capital stock at $939,942. The Empire City Subway Company, Limited, has obtained a similar writ. The company insists that the assessment of $99,000 upon its personal property is unjust and should be vacated entirely by the court.

An Inquiry that the Bell Telephone Company Might Answer.

TO THE EDITOR OF ELECTRICAL REVIEW:

The Bell company's agents claim that the use of all battery transmitters not furnished by them is an infringement. Now there are thousands of transmitters in use on private lines, also many large exchanges using Blake, Hunnings, National and others. Have we a right to use them? Or is the Bell company seeking by threats and intimidation to drive the little fish out and let the larger ones go free? An answer would oblige many. B. F.

Holly, N. Y., July 5.

THE BALTIMORE BELT LINE TUNNEL.

DESCRIPTION OF THE NINETY-SIX-TON ELECTRIC LOCOMOTIVES.

The present article concludes the description of the Baltimore belt line tunnel and its electrical equipment as it now exists. This article is devoted to a description of the big 96-ton electric locomotives, which are now in regular service. On July 16 one of these locomotives easily hauled through the tunnel a 1,200-ton freight train, including two Mogul steam locomotives, which pushed and hauled the train after the electric locomotive let go. One of the steam locomotives, weighing 80 tons, could not even start the train mentioned.

FIG. 1.—END VIEW OF NINETY-SIX-TON ELECTRIC LOCOMOTIVE FOR BALTIMORE BELT LINE TUNNEL.

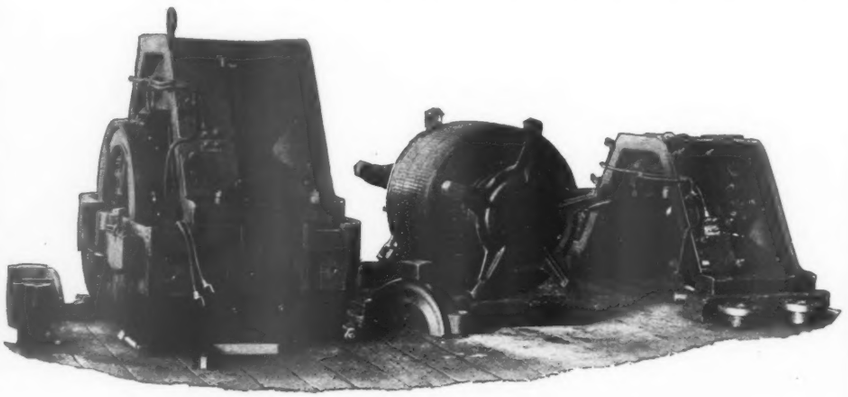


FIG. 2.—VIEW OF MOTOR UNASSEMBLED.

The General Electric Company undertook the task of building these machines, and the tests made on the one completed, before it left the Schenectady shops, showed that it is fully equal to all reasonable requirements of trunk line service. It was designed to do very heavy work and to handle trains, such as the largest steam locomotives handle. It is, of course, also designed to run in either direction. The dimensions are as follows :

Number of trucks, 2.
Number of motors, 4, two to each truck.
Weight on driving wheels, 192,000 pounds (96 tons).
Number of driving wheels, 8.
Drawbar pull, 42,000 pounds.
Starting drawbar pull, 60,000 pounds.
Gauge, 4 feet 8½ inches.
Diameter of drivers, 62 inches outside of tires.
Length over all, 35 feet.
Height to top of cab, 14 feet 3 inches.
Wheel base of each truck, 6 feet 10 inches.
Extreme width, 9 feet 6¼ inches.
Diameter of sleeve bearings, 13 inches.

The driving gear consists of a cast steel spider shrunk on and keyed to a cast steel driving sleeve, having a tensile strength of not less than 80,000 pounds. Each arm of the spider is provided with a double rubber cushion, with a chilled iron wearing cap, the cushion being forced into the arms of the spider and the cap. The eight driving wheels are of cast steel pressed and keyed to the axles and have tires three inches thick at centers of tread shrunk on to the wheel centers. The driving axles are of special open hearth steel. The journal bearings are outside the driving wheels and allow of easy access to all parts of the truck frame and driving box. In the design of this are embodied the good features of the steam locomotive driving box and passenger car box. It is of cast-iron with a phosphor bronze bearing fitted on in a similar manner to that of a steam locomotive driving box. It slides in jaws protected by shoes in the same way. The box is closed at the bottom and has a well for oil and waste, as well as a dust guard lid, etc., similar to an improved passenger car box. Large grease cups are cast into the journal caps, giving a satisfactory lubrication to the motor bearings.

The two opposite side frames of each truck rest upon four wheels, each consisting of one piece of hammered wrought-iron, three and one-half inches thick, to which the frame jaws are welded, and protected from wear by cast-iron shoes, and are connected together at the ends by heavy forged iron plates, with oak bumper beams between them.

The drawheads are of the Janney type, similar to those used on the Baltimore & Ohio passenger locomotive tenders, and are made of cast steel with wrought-iron knuckles. In coupling with freight trains the ordinary link and pin will suffice; but for passenger service the Janney couplers, with which each locomotive is provided, are used. The front and back of the locomotive are provided with safety chains, and in addition to the regular couplings, between the trucks, safety links are used. The buffers between the motors act as spacers for, and fit between plane surfaces in, the field magnets. These spacers have a complete freedom of movement which allows the field magnets to rotate when the motor is in action. These buffers and spacers are so placed as to permit the interchange and reversal of the positions of the field magnet without requiring change in the position of the spacers.

The motors are supported on carriers bolted to the field magnets and rest in adjustable hangers carried on half elliptical springs placed on top of the frame and bumpers. The frames thus carry the motors by carriers and springs, and this load is carried in turn by rubber blocks in a cast-iron casing.

The cab is of sheet steel. Two drop windows are provided at each end and four at each side, so that an unobstructed view may be had in all directions. The doors slide laterally on large rollers and are placed one on each side of the cab. The cab is supported on the frame by four half elliptical springs. The cab steps are attached to the cab only and hand rails are placed at each door. The shields are also of sheet steel supported on coil springs directly on the bumpers and are adapted to receive the air tanks at the ends, and bell, whistle and headlights on the top. The arrangement is such that all the commutators are visible to the motormen.

The locomotive is fitted with sand boxes, and Westinghouse automatic driver and train brakes are provided for all wheels, bearing upon the flanges and outside tread only. A brass signal gong eight inches in diameter is placed in the cab to be rung from either end of the locomotive. The headlights, of which there are two, are placed on the top of the shields at each end, and are 23-inch lights of Baltimore & Ohio standard pattern. One shield also carries a Baltimore & Ohio standard whistle, blown by compressed air. The other shield carries a standard bell, operated by an automatic air pressure bell-ringer. The locomotive is painted with the standard color and design of the Baltimore & Ohio Company.

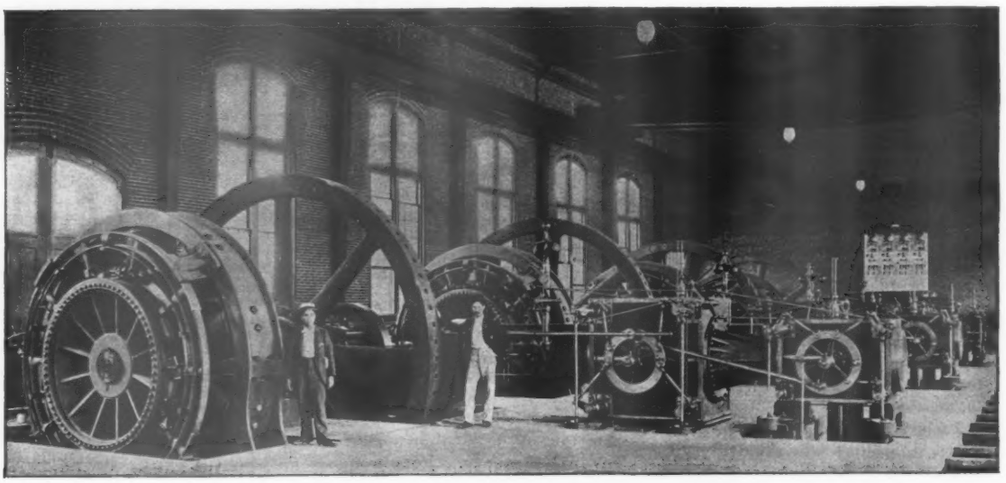


FIG. 3.—INTERIOR VIEW OF POWER STATION, BALTIMORE BELT LINE TUNNEL.

The gearless motors are four in number, two to each truck, flexibly supported and transmitting their power to the wheels through the flexible connections described above. They are of pyramidal shape, are the largest railway motors in the world and, while ponderous in appearance, are by no means so bulky as might be expected from the heavy work they have to perform.

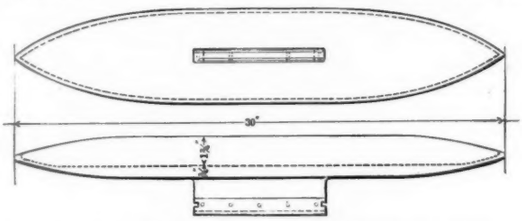


Fig 4.—Contact Shoe used in Baltimore Belt Line Tunnel.

Each has six poles and six sets of carbon brushes, the brushes being connected to a yoke revolving through 360 degrees to facilitate accessibility to them. It is possible to remove four brushes without disabling the motor. The field spools are encased in sheet-iron cases and fitted over the pole pieces bolted to the field frame. The armatures are built of sheet-iron laminations and are series drum wound. They are known as iron-clad, each insulated winding being embedded in an insulated slot cut into the outer surface of the armature body and held therein by a wooden key. This armature, with the commutator, is mounted upon and keyed to the hollow sleeve which is carried on the journals on the truck frame. The inside diameter of the sleeve is about two and a half inches larger than the axle. The entire motor is practically fireproof.

When normally placed the motor rests in a position concentric to the axle, the clearance between the axle and the sleeve allowing of a flexible support. The interposition of the rubber cushions, through which the torque of the armature is transmitted to the driving wheels, allows the armature to run eccentric to the axle, when the motor departs from its normal position on account of any unevenness in the track. The motor is designed to allow of ready removal of the field frame for inspection or repair.

A test of the first completed truck, representing one-half of the locomotive, was made upon the tracks at the Schenectady shops of the General Electric Company. In order to obtain the necessary load, a heavy six-wheel engine was made use of and the electric locomotive truck coupled to it. The machines were then sent in opposite directions and tugged at the connecting coupling as in a tug of war. The electric locomotive had a slight advantage over the steam engine in weight on the driving wheels, and pulled it up and down the track with apparent ease. For the same weight upon the drivers it was shown that the electric locomotive starts a greater load than the steam locomotive. The pull being constant throughout the entire revolution of the wheel, the difficulty of variation of pull with the angle crank, as in the steam locomotive, is eliminated. The test also proved that not only are the motors sufficiently powerful, but that the driving mechanism and armature couplings are amply strong to transmit the torque of the armature to the axle. Each motor is rated at 360 horse-power and takes a normal current of 900 amperes.

The controlling devices and measuring instruments, etc., occupy the interior of the cab. The controller is erected in one half of the cab, and is of the series parallel type. The reversing lever projects through the upper plate of the controller cover. The resistances are placed around the frame beneath the floor of the cab.

The locomotive is equipped with a 1,200 to 3,500 automatic circuit breaker and one 2,000-ampere magnetic cut-out, a 5,000-ampere illuminated dial Weston ammeter and one illuminated dial Weston voltmeter. The compressed air for the whistle and brakes is supplied by an oscillating cylinder electric air pump, the air tanks being placed at each end of the complete locomotive. The interior of the cab is illuminated by clusters of incandescent lights.

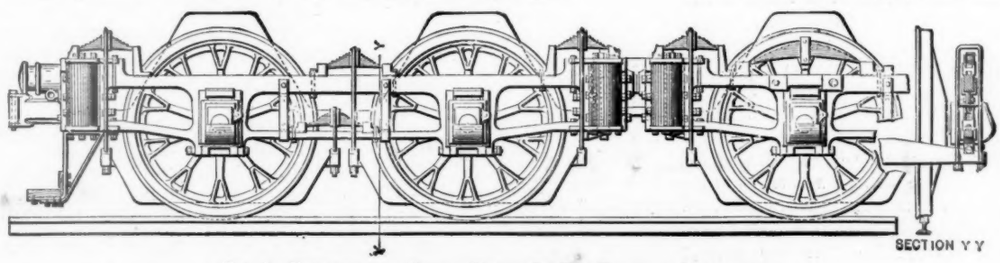


Fig. 6.—Elevation of Truck, Ninety-Six-Ton Electric Locomotive.

Contact with the overhead conductor is effected by means of a sliding shuttle-like shoe of brass, which is fixed to a flexible support fastened to the top of the cab. This "trolley" support is diamond shaped and compressible, contracting and expanding as the height demands, and is arranged to lean on one side or the other as the locomotive runs on one side or the other of the overhead conductor. It is, however, rigid in so far as movement forward or backward over the locomotive is concerned. The current is brought to the locomotive by means of cables connected to the shoe and fastened to the "trolley" support.

Represented Himself as General Agent.

Dr. W. M. Cleveland was arrested at Atlanta, Ga., on July 12, charged with obtaining money under false pretenses. He was released the next day on the promise that he would leave the city at once. He represented himself as an agent of the Electric Transportation Company, of New York, which has secured the concession for operating electric launches at the Cotton States and International Exposition to be held in the Fall. Cleveland got $5 from each of four young men to whom he promised positions with the Electric Launch Company. He was arrested on a telegram from New York, but later made a settlement and was released.

Mr. Frank C. Mason, superintendent of the Police Telegraph Bureau, Brooklyn, returned last week from a six weeks' visit to Europe. Mr. Mason was very handsomely received by the police officials of London and Paris and took much interest in looking through the different departments. In London he was tendered a theater party by his friends, Mr. and Mrs. James Coke, at the Gaiety, afterwards enjoying a supper in the East Room. Before leaving London, Mr. Mason gave a dinner to a number of his London friends at the Hotel Savoy.

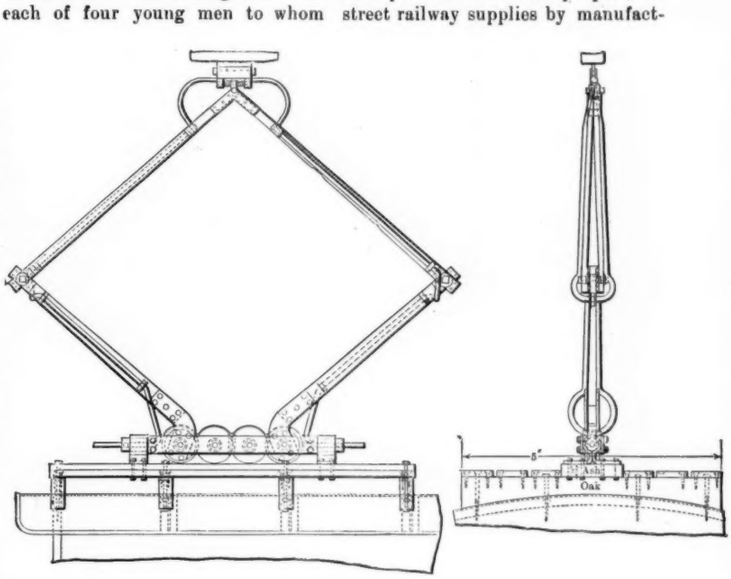


Fig. 5.—Overhead Trolley Used on Belt Line Tunnel Locomotives.

The Pennsylvania Street Railway Association.

To the Editor of Electrical Review:

The fourth annual meeting of the Pennsylvania Street Railway Association will be held at Wilkesbarre, September 4 and 5. The members of the association will convene on Wednesday, September 4, at 11 o'clock A. M., at which meeting the usual annual business of the association will be transacted, including the election of officers of the association for the ensuing year. Papers on different subjects of interest to the members of the association will be read and discussed, and the general interests and welfare of street railways considered. There will also be an exhibition, in the large and commodious hall provided for that purpose, of street railway supplies by manufacturers and dealers, to an inspection of which the greater part of the next day will be devoted. Persons desiring to exhibit their supplies will write for space to John Graham, Esq., Wilkesbarre, Pa.

Thursday, September 5, will be devoted to an inspection of the exhibits of supply men, together with such entertainment as may be provided for the members of the association, including an excursion over the lines of the Wilkesbarre & Wyoming Valley Traction Company.

All street railway companies in the State of Pennsylvania, as also manufacturers and dealers in street railway supplies, who, by a recent amendment to the by-laws of the association, are eligible to associate membership, and all persons generally interested in promoting the interests of local rapid transit lines are not only invited, but earnestly requested to be present at the meeting and participate in its deliberations.

Those desiring membership, who have not already joined the association, can do so by sending the membership fee, $25, together with one year's annual dues, $10, to the secretary, S. P. Light, Lebanon, Pa. The advantages of co-operation by means of State organization are so well known to street railway interests that it is unnecessary to particularize them.

For further information address John A. Rigg, president; S. P. Light, secretary, Lebanon, Pa.

THE INDUCTANCE OF THE DI-ELECTRIC.

BY JOHN S. STONE.

Mr. Oliver Heaviside is at once the man who has studied most exhaustively the propagation of variable currents along conductors and the man who has been most successful in originating suitable names for the constants which occur in the discussion of alternating current problems. For these constants he has devised a complete and systematic nomenclature, some of the terms of which, such as the words *impedance* and *inductance* have met with remarkable favor, not only with writers in our own language, but have been adopted almost universally by those continental writers who make use of these constants in their writings.

The term inductance of the di-electric is an extension of this nomenclature which, though very apt, has, I believe, been confined in its use to its author, Mr. Heaviside.

Having been asked a number of times to explain either the meaning or the *raison d'etre* of this term to readers of Mr. Heaviside's works, and as a more extended use, not only of the term, but of the concept of which it is the expression, would, in many cases, lead to a more clear conception of the reaction of the so-called "skin effect" upon the inductance of a circuit, I venture the following explanatory remarks upon a subject which has been treated very ably by others:

The inductance of self-induction per unit of length of a cylindrical wire to a steady current, we know, may be expressed as:

$$A + \frac{1}{2}\mu \qquad (1)$$

where A is a constant, depending on the size and form of the surrounding medium and on its permeability, or inductivity as Mr. Heaviside would call it, while μ is the permeability, or inductivity, of the material of the wire. It will be observed that the first term in this expression depends solely on the di-electric or surrounding medium, while the second term depends on the nature of the conductor alone. The first term, therefore, Mr. Heaviside has called the inductance of the di-electric, which name accords well with the fact that electro-magnetic inertia is a property of the media forming and surrounding the circuit, and not of the current as might be inferred to be the case from the hydraulic analogy.

As an illustration of the above a specific case may be taken where the circuit consists of a circular loop of cylindrical wire. The expression for the inductance of such a circuit to steady current is:

$$2\mu\pi D\left(\log_{\varepsilon}\frac{4D}{\rho} - 2\right) + \frac{1}{2}\mu, \; l \qquad (2)^*$$

in which μ is the permeability or inductivity of the di-electric, D is the diameter of the loop, ρ is the radius of the wire, μ is the permeability or inductivity of the material of the wire, and l is its length. The first term in this expression, it will be observed, contains only such quantities as determine the size, form and magnetic properties of the di-electric, whereas the second term contains only the length and magnetic properties of the wire. The first term, therefore, is the inductance of the di-electric. If now we assume the current to be confined to the surface of the wire, as would be the case if the current were very rapidly fluctuating, the wire can play no part in determining the inductance of the circuit, we find the expression for the inductance to be simply the first term of (2).

Remembering one of the definitions of inductance, which has for its expression,

$$L = \frac{\Phi}{I} \qquad (3)$$

in which Φ is the flux enclosed by the loop and I is the current producing the flux, we see that the above is not an accident of mathematical expression, but simply means that the first term of (1) and (2), *i. e.*, the inductance of the di-electric, represents that part of the inductance of the circuit which is due to the flux or lines of force external to the wire, whereas the second term represents that portion which is due to the induction or lines of force within the wire itself, the inductance of the circuit being the sum of these two parts.

$$L = \frac{\Phi}{I} + \frac{\Phi}{I} \qquad (4)$$

Thus far, though the existence of the above described difference between the two terms, which constitute the inductance of a circuit has been pointed out, there has been no reason given for applying a special name to one of these terms, both of which are constants and together constitute one of the constants of a circuit. In fact, if we are considering only the flow of steady or slowly varying currents, there would not seem to be much reason for distinguishing between these two factors in the inductance of circuits. In the study of the flow of direct currents, however, the inductance of the circuit is, at best, of little importance, whereas it is of paramount importance when the current is rapidly varying. In this latter case, that part of the inductance of the circuit depending on the induction in the material of the wire ceases to be a constant of the circuit and becomes a function of the rate of change of the current as well. The more rapid the rate of change of the current the more the current tends to concentrate upon the surface of the wire, the less deep is it able to penetrate into the wire, until, at very high frequencies, the current approximates a surface distribution on the wire. Under these latter conditions there can be no induction within the material of the wire and, as a consequence, that part of the inductance which is due to the flux within the wire becomes zero. It will be seen from the above that the only constant portion of the inductance of the circuit is the inductance of the di-electric. This, in itself, might be considered sufficient reason for giving it a special name to distinguish it from the inductance of the circuit or from the inductance due to the induction in the wire.

This constant of a circuit is of greater importance, however, since in the study of the transmission of alternating currents along wires suspended above the earth at some distance apart, as in telephony and telegraphy and in the discussion of problems on electrical oscillations along conductors very generally, a marked simplification in the expressions results due to a remarkable property of the inductance of the di-electric.

This property of the inductance of the di-electric is best illustrated as follows: The inductance of the di-electric of a circuit composed of two equal parallel cylindrical wires in space is,

$$2\,l\log_{\varepsilon}\frac{D^2}{\rho^2}$$

where D is the distance between the wires of radius ρ. The electro-static capacity of this circuit is,

$$l\,\frac{1}{2\,v^2\log_{\varepsilon}\frac{D^2}{\rho^2}}$$

we therefore have,

$$L = \frac{1}{C\,v^2} \qquad (5)$$

where v is the velocity of light or the ratio of the electro-magnetic to the electro-static unit of quantity.

This result may not in itself seem very remarkable, but the simplifications in the expressions which result from its use in alternating current flow on conductors having capacity resistance and inductance are truly striking. As an example, we may take the solution of the problem of a simple harmonic electro-motive force, $E_o \sin p\,t$ impressed at one end of an infinite line whose constants per unit of length are R', L' and C. The current and electro-motive force at a point x along this line will be respectively:

$$i_x = E_o\left[\frac{C\,p}{(R'^2 + L'^2 p^2)^{\frac{1}{2}}}\right]^{\frac{1}{2}} \varepsilon^{-P x}\sin(p\,t - Q\,x - \varphi)$$

and

$$e_x = E_o\,\varepsilon^{-P x}\sin(p\,t - Q\,x)$$

where

$$P = \left[\frac{C\,p}{2}\left\{\sqrt{R'^2 + L'^2 p^2} - L'\,p\right\}\right]^{\frac{1}{2}}$$

and

$$Q = \left[\frac{C\,p}{2}\left\{\sqrt{R'^2 + L'^2 p^2} + L'\,p\right\}\right]^{\frac{1}{2}}$$

$$\text{The wave speed} = \frac{p}{Q}$$

$$\text{The wave length} = \frac{2\pi}{Q}$$

$$\varphi = \frac{L'\,p\,P - R'\,Q}{R'\,P + L'\,p\,Q}$$

If the frequency is sufficiently high to make the inductance L' practically equal to the inductance of the di-electric we have,

$$i_x = \frac{E_o}{L_o\,v}\,\varepsilon^{-P}\sin\left(p\,t - \frac{p\,x}{v}\right)$$

$$e_x = E_o\,\varepsilon^{-P}\sin\left(p\,t - \frac{p\,x}{v}\right)$$

$$P = \frac{R'}{2\,L_o\,v}$$

$$Q = \frac{1}{v}$$

$$\text{The wave speed} = v$$

$$\text{The wave length} = \frac{v}{n}, \text{ where } n = \frac{p}{2\pi}$$

and the angle of lag between the currents and the electro-motive force is practically zero.

It is obvious, from the above example, how great a simplification may be gained by the use of this property of the inductance of the di-electric, and it is surprising that in some of the more recent writings on the subject of alternating currents no use of or allusion to it is made.

*A correction has to be added to this expression when the diameter of the loop is not large compared to the radius of the wire, but the correction is in most cases quite negligible.

Cotton States and International Exposition.

The Department of Electricity has received the first shipment of machinery for installation. It consists of the General Electric Company's alternator of 250-kilowatt capacity for incandescent arc lighting and power. It weighs 37,000 pounds.

Work has been commenced on the wiring for electric lights, both external and internal. Orders have been placed with the General Electric and Westinghouse companies for all the incandescent lamps and fixtures, and with the Safety Insulated Wire and Cable Company, of New York, for the underground cables.

The work on the electric fountain is progressing rapidly. All the timber work will be completed in a few days. A sensation is in store for the public in this electric fountain, as it will surely surpass anything of the kind ever shown or constructed heretofore. Nothing of the kind has ever been seen in the South, and the fountain will surely be the central feature of the exposition.

The Folsom-Sacramento Power Transmission a Success.

Current generated by the falls of the American River at Folsom, Cal., was successfully delivered to the electric railway system in Sacramento, 24 miles distant, on July 15. The use of the current will be gradually extended to all kinds of industrial establishments and used for light and heat. The hydraulic work on the plant was begun in 1866. Lately the work has been extended until now there is 5,000 horse-power available for transmission, besides 1,200 horse-power for use in the State prison. This plant was fully illustrated and described in the ELECTRICAL REVIEW for April 10, 1895.

Mr. A. C. White, the Rhode Island telephonite, came over from Providence one night last week and spent seven and one-quarter hours enjoying the cooling breezes of New York. Telephone matters are very good with his company, but slight opposition from new companies having materialized as yet.

TELEPHONE NEWS AND COMMENT.

The state telephone system of Sweden is soon to be connected with the state telegraph system. Instead of addresses, the telephone numbers will be used, the telegraph clerks looking up the address. Messages may be telephoned to the telegraph office and telephoned back, thus dispensing with the greater number of the messenger boys, as in Sweden nearly every one uses the telephone.

Mr. H. M. Brinkerhoff, electrical engineer for the West Side Construction Company, Chicago (known as the Metropolitan Elevated Railway Company), has awarded the contract for furnishing a telephone system to the Western Telephone Construction Company, Chicago. This system contemplates about 30 telephone outfits, one at each station, so that communication may be had from point to point.

It may not be generally known to his friends that Secretary Joel C. Clark, of the New York & New Jersey Telephone Company, occasionally drops into poetry. The following little incident is from Mr. Clark's pen and is prettily told acrostically:

Passing in haste along a city street,
Late on a Winter day, I chanced to meet—
Entreating with her eyes, as well as tongue—
A little maid, whose hood was all unstrung;
She could not possibly (so cold the weather),
Except with help, keep its two sides together.
"PLEASE PIN ME, SIR!" she asked me, with a smile.
I paused, and took the pin she held the while.
Nor could I, urgent as my haste might be,
Move past, regardless of that touching plea!
Eager to aid, I "pinned" the pretty miss.
She tendered thanks. Would it had been a kiss!
I hurried on, but left her cheeks less cold:
Rewarded for my pains a hundred fold.

OUR BOSTON LETTER.

The W. S. Hill Electric Company made an assignment at noon on Thursday, July 18, to Ferdinand A. Wyman, of Boston. While this news will come as an unpleasant surprise to the many friends of this old and well-known concern, they will be pleased to know that the difficulty is only of a temporary nature and that it will soon be satisfactorily adjusted. The trouble was brought about by a lack of sufficient capital to handle the large bulk of business the firm has on hand, and was augmented by the general slowness of collections. Business was never better with them than at the present time, and they now have contracts on hand aggregating some $10,000; among them being a large order for the Congressional Library in Washington, for which they have prepared a quantity of special designs. Assignee Wyman is a man well calculated to bring them smoothly out of their present difficulties, and the business will be carried on exactly as heretofore. As soon as practicable a reorganization will be perfected and with a largely increased capital the concern will be put on a firmer financial basis than ever before.

The sixth annual meeting of the Massachusetts Electric Lighting Association was held at the Atlantic House, Nantasket, on Wednesday the 17th inst. at 12 o'clock. The 90 odd members present enjoyed the usual good dinner and speeches, and the routine business being disposed of, the election of officers for the ensuing year was held. This resulted in the re-election of F. A. Gilbert, of Boston, to the presidency and of T. C. Bates, of Worcester, and C. L. Edgar, of Boston, as first and second vice-presidents, respectively, as well as the re-election of the entire board of executive officers. The affairs of the association were reported to be in a most satisfactory condition.

Boston, July 20. H. G. T.

Three Thousand Volts Killed Him.

Thomas Hefferman, an employé of the Newark, N. J., Electric Light and Power Company, was found lying dead on the floor of the dynamo room at midnight on July 18. He was last seen alive shortly after 11 o'clock, and was then wiping around a generator, from which the current was not cut off. Hefferman failed to shut off the safety switch before going to work. One of the other workmen felt anxious about him at midnight and went to look for him. He found Hefferman lying face downward between two generators with both of his hands badly burned, indicating that he had made a complete circuit with both hands and received the full pressure of 3,000 volts. He was carried out, and efforts were made to resuscitate him by the D'Arsonval method. It was unavailing.

FIG. 2.—THE DUDLEY TELEPHONE SIGNAL WITH COVER REMOVED.

The Dudley Telephone Signal.

The telephone world is eagerly looking for an individual signal which will free party-line service from the constant ringing of all bells on the line when a subscriber is called. In many cases this objection is strong enough to prohibit such party-line construction. It is conceded, moreover, that the general use of telephones demands a low annual rental, and that this can be effected by putting several subscribers on each line. The chief objection to this method of construction, namely, the constant ringing of the bells and the necessity of a special ring for each subscriber, is overcome by the use of the Dudley signal, which short-circuits all bells until the subscriber wanted is called, when that particular bell is cut in and rung by a device at the central office. More than 100 signals have been devised, but the majority were too expensive, or required an expert to keep them in working order, and have been of little practical value. The Dudley signal is simple, inexpensive and easily adjusted. It is operated by a step by step movement and actuated by a central office transmitter or switch, as shown in Fig. 1. The central office instrument is connected with a battery, generator and a plug for the switchboard.

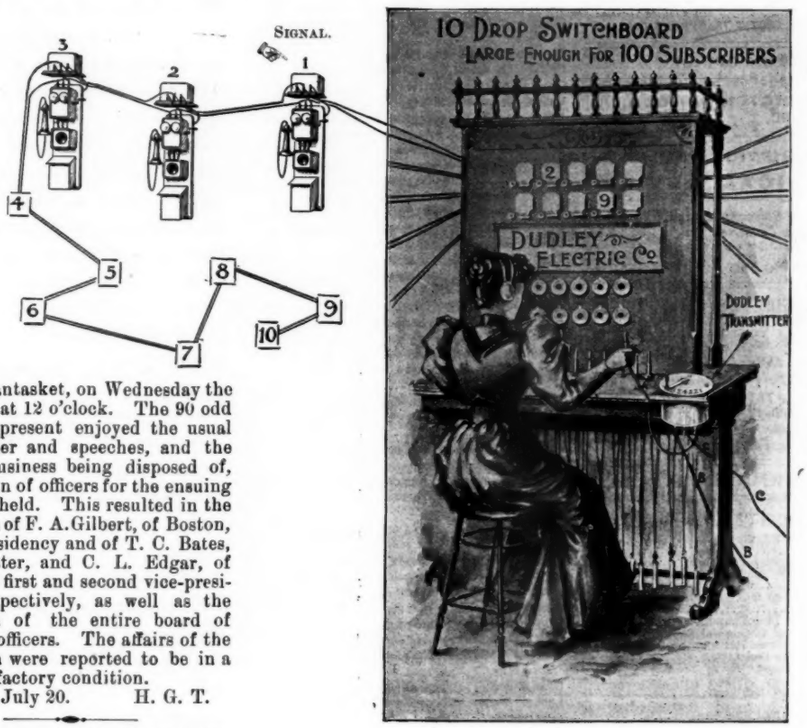


FIG. 1.—SHOWING DUDLEY SYSTEM OF TELEPHONE SIGNALS.

When a subscriber is to be called, as, for instance, 3 in Fig. 1, the operator inserts the plug and turns the crank of the switch around to 3. Connection is made with the battery, which sends out impulses to all the signals which are wired into telephones at subscribers station. On the ratchet wheel of the signal is placed a pin which makes the contact for the bell. If office 1 is required, the pin is placed opposite the first tooth of the ratchet wheel from the point called the zero point; 2 opposite the second tooth, and so on, as many places as there are on that line. When in any office the bell circuit is completed it is broken in all the other offices on that line. The central office instrument, after bringing all the signals into unison, makes a second contact with the battery, and automatically works the signals the desired number of times, when that signal, as, for instance, 3, opens the circuit, and the generator, by a third connection made in the central office switch, rings the bell. Where a motor is used in the central office the operator simply inserts the plug and turns the crank of the switch to the desired number on the dial, and the subscriber is called automatically.

The Dudley system has been thoroughly tested in large and small offices with perfectly satisfactory results to the subscriber and central office operator. These devices can be used with any telephone on a grounded wire or metallic circuit, and the company is ready to guarantee its claims in every instance. The system is owned by the Dudley Electric Manufacturing Company, with offices at 81 New street, New York, room 65, where the working of the instruments can be seen.

Hon. Marsden J. Perry, of Providence, ex-president of the National Electric Light Association, in addition to looking after his large electrical interests, finds time to take care of the finances of one of the biggest banks in his city, of which he is president. Mr. Perry's duties as one of the receivers of the New York & New England Railroad, along with Hon. T. C. Platt, bring him to New York quite often.

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SPECIAL NOTICE TO ADVERTISERS.

CHANGES for advertisements must be in this office by Friday noon for the following week's issue.

NEW ADVERTISEMENTS should be in the office not later than Saturday noon to insure publication the following week.

NEW YORK, JULY 24, 1895.

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The advantages of the alternating current for mine installations are rapidly being appreciated. The absence of commutators, brushes and sparking are great advantages, making it possible to use electric cutters with safety in gaseous mines.

We understand that a wealthy and distinguished citizen of New York has caught an electrical inventor and has him caged uptown somewhere at work on an electric motor for a locomotive which will supersede the steam locomotive. We would suggest to our distinguished fellow citizen who, we have reason to believe, is in blissful ignorance of electrical science, that he caught his inventor too easily — he wanted to be caged. There is an old saying, "*Procul, O procul este, profani,*" which means that our friend would better keep off the grass.

A communication from Mr. Paul Minnis, manager of one of the new opposition telephone companies in the South, will be found on another page in this issue of the ELECTRICAL REVIEW. Mr. Minnis, who discusses his subject frankly, believes it would be well for the opposition telephone exchanges to form an association distinct from an association of manufacturers. We believe in such institutions, but suggest that one association should be big enough to harbor both manufacturer and consumer. Such associations exist flourishingly in the electric light and electric railway fields, and there would seem to be no good reason why the same thing should not hold good in the new telephone field.

TROLLEY VS. TELEPHONE.

A very important addition to the subject of the conflicting rights of electric railway companies and telephone companies in the use of streets is made by the recent decision of the Supreme Court of Tennessee in Cumberland Telephone and Telegraph Company *vs.* United Electric Railroad Company, 93 Tennessee 492, 27 L. R. A. 236, reported in our legal contemporary *Case and Comment*. At first sight the case seems to be directly opposed to the decisions in other jurisdictions on this subject. In several of these cases the courts had held that a telephone company could not by the prior use of a street obtain a paramount right to such use as against a street railway company so as to prevent the latter from using a current of electricity necessary for its purposes, even if it destroyed the working of the telephone. On this ground they have denied the telephone company the right to an injunction against the operation of such a railway. Decisions to this effect were made in Cumberland Telephone and Telegraph Company *vs.* United Electric Railway (C. C. M. D. Tenn.) 12 L. R. A. 544; Cincinnati Inclined Plane Railroad Company *vs.* City and Suburban Telegraph Association (Ohio) 12 L. R. A. 534; Hudson River Telephone Company *vs.* Watervliet Turnpike and Railroad Company (New York) 17 L. R. A. 674. It seemed that such authorities as these had substantially settled the law in favor of the electric railways as against the telephones. But the new Tennessee decision makes some very interesting distinctions. While the other cases referred to were cases for injunction, the Tennessee case is a suit for damages to the telephone plant. The decision therein sustains the right of the electric street car line to use the streets as an ordinary street use subject to which the telephone franchise was granted, and denies the right of the telephone company to recover for loss sustained from induction on account of parallelism of wires, but sustains its right to damages caused by conduction resulting from the use of the ground circuit by the street railway as a single trolley line, the effect of which was to charge the earth for half a mile on each side and beyond the limits of the streets with powerful currents of electricity. The result of the case was to make the street railway company liable for the cost of return wires for the telephone line, which it was obliged to substitute for the ground circuit, in addition to the damages caused by what was held to be an unnecessary conflict of poles and wires. The distinction between the damage caused by induction on account of parallel wires and that caused by conduction charging the earth outside the street limits seems to be a new one in this branch of litigation. The judges of the court were not altogether agreed. Some dissented, and those concurring in the decision were not all agreed as to the ground of it. Nevertheless a majority sustained the decision on the ground above mentioned.

A SEVEN-POLE DYNAMO.

TO THE EDITOR OF ELECTRICAL REVIEW:

Your paper of July 17, page 40, has a good cut of a novel dynamo—one of *seven* poles.

The Belknap people must re-design the cut or the machine.

But the paper is a good one. T. J. J.

Schenectady, N. Y., July 18, 1895.

[We are much pleased to receive renewed evidence that the ELECTRICAL REVIEW is so carefully read and examined. The acute legal mind of our correspondent, who is an attorney in the General Electric Company's patent department, has discovered an error which is undoubtedly to be credited to the engraver.]

NORTHWESTERN ELECTRICAL ASSOCIATION.

THIRD SEMI-ANNUAL MEETING HELD AT CHICAGO—THE ATTENDANCE —THE EXHIBITS—NEW OFFICERS ELECTED.

The third semi-annual convention of the Northwestern Electrical Association was called to order by Secretary Goetz, with Vice-president George Grimm in the chair, owing to the death of Henry C. Thom while in office, at 10.30 A. M., Wednesday, July 17, at the Leland Hotel, Chicago. The following members responded to the roll call:

ACTIVE MEMBERS PRESENT AT THE CHICAGO MEETING.

G. L. Cole, Beloit; George A. Farwell, Waukesha; C. Gunderson, Madison; P. H. Korst, Racine; C. P. Lord, Waupaca; C. C. Paige, Oshkosh; John Schuette, Manitowoc; W. H. Thorp, Beaver Dam; W. H. Upham, Marshfield; J. F. Wiley, Stevens Point; Pliny Norcross, Janesville; William Goetz, Milwaukee; R. F. Kountz, Neillsville; T. F. Grover, Wauwatosa; George Grimm, Jefferson; O. M. Rau, Milwaukee; G. M. Newton, Sparta; T. R. Merceib, Milwaukee; M. A. Warren, Baraboo; George S. McLaren, Milwaukee; F. A. Copeland, La Crosse, Wisconsin; Carroll Collins, Peoria; F. Overbaugh, J. S. Stephen, Fred De Land, Charles G. Burton, John C. McMynn, W. J. Ferris, Chicago, Illinois; J. H. Harding, La Porte, Indiana; H. O. Woodruff, Sioux City; E. M. Highlands, Clinton, Iowa.

ASSOCIATE MEMBERS.

A. C. Bunce, General Electric Co.; W. W. Low, Electric Appliance Co.; F. McMaster, Electric Appliance Co.; G. A. McKinlock, Central Electric Co.; B. S. Terry, A. W. Harris Oil Co.; H. D. Latimer, Central Electric Co.; S. F. B. Morse, S. F. B. Morse & Co.; George White, Washburn & Moen; F. N. Boyer, Central Electric Co.; Loren W. Burch, Metropolitan Electric Co.; C. E. Gregory, Chas. E. Gregory & Co.; F. E. Donohue, American Electric Works; John R. Markle, Electrical Storage Battery Co.; Chas. S. Marshall, Chicago Cross Arm Co.; J. Stedman, Page Belting Co.; W. Wilson, Electric Appliance Co.; James Wolff, New York Insulated Wire Co.; L. H. Cooke, Buckeye Lamp Co.; M. B. Austin, New York Safety Insulated Wire Co.; Chaning S. Gage, Washburn & Moen Manufacturing Co.; John Valentine, Valentine-Clark Co.; C. D. Wilkinson, Western Electric Co.; W. C. Remington, *Electrical Industries*; C. O. Baker, Chicago Glass Fixture Co.; M. C. Wheaton, Glass Fixture Co.; W. D. Jameson, Dearborn Boiler Compounds; J. S. Paulson, 314 Thirty-first street, Chicago; Lewis Brittan, M. Hussey, Robert W. Ney, Waukegan; John B. Whalen, Sycamore; E. P. Maxwell, Dixon; A. G. Luthy, Peoria; Theo. Wiberling, Peru, Illinois; M. L. Stevenson, National Carbon Co., Cleveland; Crouse-Tremaine Co., Fostoria, Ohio; R. A. Wilson, Marquette, Michigan; Eugene Hall, Burlington, Wisconsin.

OFFICERS ELECTED.

President, George Grimm; first vice-president, Pliny Norcross; second vice-president, P. H. Korst; secretary, William Goetz; treasurer, John Schuette.

HONORARY MEMBERS.

George Cutter, John C. McMynn, A. V. Abbott, Chicago, Ill.

The reading of the annual address of Vice-president George Grimm, acting president of the association, was the first feature of the day and was largely devoted to an eulogy of Henry C. Thom, the late president of the association, following, also, with a general summary of the condition, aims and needs of the Northwestern Electrical Association. Following this address the president read two letters from the widow of the late Mr. Henry C. Thom, conveying expressions of gratitude for the sympathy shown at the death of her husband by the association both collectively and individually. It was moved and seconded that the chair be authorized to select a committee to prepare suitable resolutions in memory of the deceased president, and Messrs. Norcross, Copeland and Lord were chosen.

As there were no reports to be rendered by the committees, except the reading of the plan of entertainment by Chairman Bunce, of the Entertainment Committee, the house listened to the reading of a paper by J. S. Stevens, of the Russell Engine Company, on "Central Station Economics." This was followed by a paper on "Electrical Interferences," read by A. V. Abbott, and a general discussion of the ideas suggested in the two papers occupied the time until 12 o'clock, the end of the first business session.

In the afternoon a party of the visitors, by special invitation, looked through the plants of the Chicago Edison Company and the Metropolitan power house.

The attendance at the second meeting on the following day was larger, and the members seemed to enter into the subjects on hand with more energy, notwithstanding the heat. The two papers of the day, "Boilers, Feedwater: Their Treatment," by W. D. Jameson, and "Electric Street Lighting," read by George Cutter, were listened to with interest. After the general discussion of these subjects the filling of the chair for the unexpired term, because of the death of Mr. Henry C. Thom, was suggested, and the secretary was instructed to cast the unanimous vote for the election of George Grimm to fill the chair for the remaining period. Mr. Norcross, by unanimous vote, was elected vice-president, and P. H. Korst second vice-president.

The meeting then adjourned for the day, and after luncheon the members went by special train to see the drainage canal.

The attention of the convention on Friday, the last day of the meeting, was occupied during the early part of the session by the reading of a paper written by Prof. D. C. Jackson, of the Madison University, on "The Choice of Transformers, the Advantage to be Derived by Testing Every Transformer Before Placing on the Line." The paper was read in the absence of Professor Jackson by Mr. Geo. A. Farrell, of Waukesha, Wis. Following this, Mr. John C. McMynn, of Chicago, read a well prepared paper on the subject of "Boilers and Practical Specifications for Building the Same."

After the transaction of various minor business matters with reference to committees and plans for the next meeting at Milwaukee, the Northwestern Electrical Association was adjourned.

In the afternoon a party of the gentlemen enjoyed a drive through the boulevards and around the World's Fair grounds in the Columbian coaches.

THE EXHIBITS.

The manufacturing interests of the West were well represented at the convention. Among the prominent electrical people were: James E. Pomeroy, of the Swan Lamp Manufacturing Co., Cleveland; J. M. McClave, of the Diamond Incandescent Lamp Co., Denver; G. W. Conover, western agent of the Perkins Electric Switch Manufacturing Co., Hartford; J. H. Reid, western agent of the Westinghouse Glass Factory, Pittsburgh; A. C. Bruce and W. J. Ferris, Chicago representatives of the General Electric Co.; L. B. Allen, manufacturer of Allen's Soldering Stick, Chicago; John Valentine, President of the Valentine-Clark Co., Chicago; F. W. Burlingham, president of the McDermid Manufacturing Co., Chicago; James Wolff, western sales agent of the New York Insulated Wire Co.; Chas. A. Munson, manager Chicago office of Fort Wayne Electric Corporation; J. C. Murphy, W. J. Buckley and Charles E. Wilson, all of the Fort Wayne Electric Corporation; L. W. Burch, of the Metropolitan Electric Co., Chicago; F. Overbaugh, manager of Chicago General Fixture Co., Chicago; C. D. Wilkinson of the Western Electric Co., J. S. Healey of the American Electrical Manufacturing Co., St. Louis, and Chicago manager of the Columbia Incandescent Lamp Co., St. Louis; S. F. B. Morse of the S. F. B. Morse & Co., Chicago; Willis W. Jameson, assistant manager Dearborn Drug & Chemical Works, Chicago; Harry G. Osborn, president Osborn Electric Supply Company, Chicago; Chas. S. Marshall, vice-president Chicago Cross Arm Co., Chicago; Geo. S. Searing, sales agent Gillipsie & Tartt, Edwardsville, Ill.; C. E. Woodruff, of C. E. Woodruff & Co., Chicago; L. E. Frorup, western agent General Incandescent Arc Light Co., New York; Wm. Mason, president Mason Electrical Equipment Co.; Wm. Robinson, of Robinson & Troutman, Chicago sales agents for Buckeye Engine Co.; G. G. Luthy, J. A. West and Frank Thone, of the Royal Electric Co., Peoria.

The companies which had exhibits were Fort Wayne Electric Corporation, Electric Appliance Co., Chicago; White Electric Co., Hayes-Fyfe Co., Chicago; Dearborn Boiler Compounds, S. F. B. Morse & Co., Mason Electrical Equipment Co., Osborn Electric Supply Co., Buckeye Engine Co., Lane & Bodley Co., the Standard Electric Co., Chicago.

Siemens & Halske Electric Company of America.

At a meeting of the stockholders of the Siemens & Halske Electric Company of America, held at Chicago, on July 15, the number of directors was increased from five to nine. Officers were elected as follows: President, Augustine W. Wright; vice-president, C. E. Yerkes; treasurer, O. W. Mysenburg; secretary, F. B. Badt. It is understood that Mr. Mysenburg was transferred from the presidency to the treasurership at his own request so that he would have more time to devote to the Wells-French Car Company in which he is heavily interested.

A Zinc Mold Explodes.

While a number of men employed in the Manhattan Electric Supply Company's shop at 74 Hudson street, Jersey City, N. J., were pouring molten zinc into a mold on July 20, the mold exploded. The hot zinc was scattered in all directions, and Joseph Bratler, aged 19, of 104 St. Paul's avenue, was splashed with it in the face and upper part of his body. He will probably lose the sight of both eyes.

Wall Street and the Electrical Stock Market.

The general stock market of the week was exceedingly quiet and largely professional. Commercial and agricultural conditions continue to improve. The lethargy of capital in view of these facts is due to the disposition to wait until the corn and wheat crops are nearer maturity. The movement of prices showed an average gain of ½ of 1 per cent. In no important instance was the fluctuation more than 2 points, Chicago Gas excepted. A feature of considerable interest was the export of $1,575,000 in gold. These are the first shipments since the Belmont-Morgan bond syndicate took the United States Treasury under its wing. The movement, it is stated by good judges, will not become general, as the syndicate is selling all the exchange needed at about the specie point, and expects to be helped out within a week or two by bills sold against the growing crops.

The electrical stocks were without feature. General Electric was the only security at all active, and it lost fractionally in sympathy with the early slump in the industrials and in later transactions partially recovered. The feeling of capital towards this stock, as well as Westinghouse, is bullish. They are regarded as the two great representatives of the electrical industry, and as sure to profit by the many developments which are now taking place in the transportation field. The trial of the General Electric motors on the Baltimore tunnel during the week gave results entirely satisfactory to the company and to the railroad.

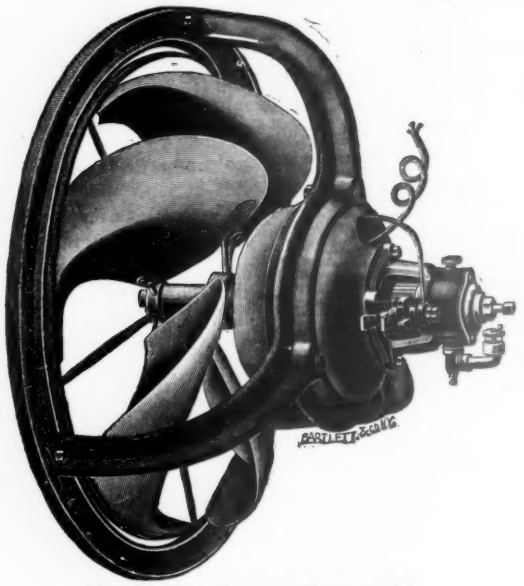
The general revival of business all over the country is bringing many new street railway enterprises prominently to the front, as it opens a market for the stocks and bonds issued against construction and improvements. It is rendering old properties more valuable, as is evidenced by the liquidation of the stock of the street railway and illuminating properties, preferred stock, as was noted in this column last week. This company was formed to take over these assets of the General Electric Company, which consisted of stocks and bonds of sub-companies, and which at the time were unsalable. They are now finding a ready market. This permits of the retiring of the stock issued against them and dividends on the amount still outstanding. Last week a dividend of 3 per cent was declared on the preferred stock, payable August 1 to stock of record July 20. Books open July 31.

On the Boston Exchange, Bell Telephone recorded its highest prices on Monday at 197. On later transactions the price declined to 195 @ 196. Electric Storage Battery was 29. New England Telephone advanced 4 points to 90, and Erie Telephone 2½ to 59¾. Both stocks closed at top prices. Westinghouse Electric made a material gain. It is quoted at 36 @ 37. The preferred was strong at 54 @ 54½. BAIN.

New York, July 20, 1895.

The Lundell Electric Exhaust Fan.

The design of the Lundell motor lends itself most readily in application to exhaust fan work. The motor, being ironclad, is almost wholly inclosed and easily permits of connection by radial arms, spider or bolts to any of the many forms of exhaust fans now to be found in the market.



THE LUNDELL ELECTRIC EXHAUST FAN.

It has been the practice of manufacturers of exhaust fans to supply a bearing in front as well as in the back of the fan, but in the application of the Interior Conduit and Insulation Company, of New York, they carry a shaft, which may be horizontal or vertical, in two bearings in the motor frame itself, not supporting the shaft in any sense from the fan ring. This course insures perfect alignment and noiseless running.

All exhaust fan outfits are made with horizontal shafts, unless otherwise ordered, and are invariably made so that the direction of the flow of air is from the motor toward the fan. If it is desired to operate the fan with a vertical shaft or to drive the air through the fan and over the motor, it can be arranged on order. With all standard horizontal shaft fans an adjustable thrust bearing, as shown in the illustration herewith, is provided. When the flow of air is desired contrary to the standard direction, a button and thrust bearing is placed at the rear of the motor.

In all horizontal shaft fans, lubrication is effected by oil. In vertical shaft fans, lubrication is effected in an oil receptacle enclosing a step at the bottom of the shaft, and a graphite or other self-lubricating bearing (never a grease cup or oil bearing) at the upper end of the shaft.

Want Better Trolley Speed in Brooklyn.

A number of prominent real estate men of Brooklyn, N. Y., have joined in a petition to the Board of Aldermen urging a modification of the ordinance restricting the speed of trolley cars to six and eight miles an hour. They contend that the reduced speed is detrimental to business interests and the development of the outlying districts of the city.

The Buckley Electric Elevator.

A new electric high-speed elevator is about to be introduced on the market by the Buckley Elevator Company, of New Orleans, recently organized for that purpose. Since the introduction of electricity as a motive power time and money have been freely expended to accomplish devices of this kind. It is claimed that this new system, in a test recently given in New Orleans, not only has demonstrated the feasibility of competing with the hydraulic system in its working capacity, but has shown a reduction of from 50 to 60 per cent in its operation.

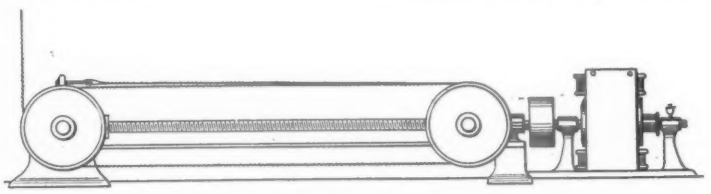


FIG. 1.—ELEVATION OF BUCKLEY ELECTRIC ELEVATOR.

The large cylinders, pump, tanks and other cumbersome auxiliaries so conspicuous in the hydraulic system are done away with, and the space made so unavailable by these requirements is no longer a loss but a gain to both the owner and lessee, not to speak of the telephoning of the pumps throughout the building and other defects so well marked where the hydraulic system is employed.

Instead of an eleborate display of machinery, a small compact antifriction machine is brought into position, either in the cellar or on the roof, where it is connected by a switchboard in the car and operated at will.

This machine is of the horizontal multiple sheave type with an antifriction roller nut through which a V-thread screw is revolved by an electric motor directly connected to one end. The most unique part of this device, however, is the nut, which is seen in Figs. 2 and 3.

It consists of four annular grooved rollers meshing in with the threads of the screw; at the truss end of these rollers are hard steel plates which are provided with hard steel balls to assure a rolling bearing at this point. When worn these plates can be renewed at a light expense and the machine made ready in a few hours.

Every part is after the usual pattern and can be manufactured or repaired in any ordinary city, for the construction is simple and requires no special expert handling to complete the entire machine. Another good feature is that the nut on which the dividing sheaves are placed is counter-balanced to a nicety, hence obviating the strain that would otherwise predominate. Mr. John P. Buckley is the designer of this new system and has been working for several years to perfect it to its present state.

PERSONAL.

Mr. Brainard Rorison, formerly secretary of the Fort Wayne Electric Company, visited New York last week.

Mr. F. S. Palmer, of the Electric Heat Alarm Company, Boston, visited the ELECTRICAL REVIEW offices last week.

Mr. C. L. Edgar, general manager of the Edison Illuminating Company, Boston, spent a few days at the Waldorf, New York, last week.

President Geo. A. McKinlock, of the Central Electric Company, Chicago, passed through New York last Wednesday, returning from a yachting trip to Bar Harbor, Me.

A New Electric Road.

The formal opening by the Holyoke Street Railway Company of their new line between Holyoke and Springfield was held on Thursday afternoon of last week, when a large party of invited guests were carried over the road. The trial trip was a pronounced success and the road was opened for business on Monday the 22d instant.

THE ELECTRIC CITY.

THE NEW RAILROADS AT NIAGARA FALLS

Niagara Falls is the interesting point for the electrician, the layman, the manufacturer and the scientist. Harnessing this great power, accomplished through the medium of electricity, has made the rambling town of six or eight thousand inhabitants one of nearly twenty thousand, and it is rapidly gaining, and the end is far off. Buffalo, 22 miles away, and the suburb Depew also feel this new life. Saturday several newspaper men of New York, under the pleasant guidance of Mr. Geo. H. Daniels, of the New York Central road, honored the Falls with a visit, returning Monday morning delighted with an instructive and entertaining day spent where there is more to be seen in a few hours than at any point in this country. A private car on the Niagara Falls Park and River Railroad was placed at the disposal of the party, and a trip along the entire length of this new electric line was made. Mr. J. C. Rothery, the superintendent, accompanied the party. His company was the first to make use of the power of the Falls in an electric way. The road extends along the Canadian side and from it is presented a very attractive and everchanging view of the Falls, rapids and whirlpool. Another road, to run on the American side at the base of the cliffs, is being constructed.

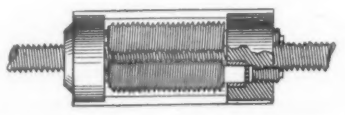


FIG. 2.—SECTIONAL VIEW OF HOISTING NUT, BUCKLEY ELECTRIC ELEVATOR.

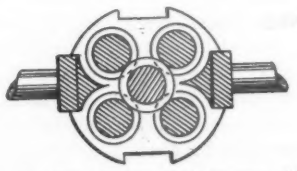


FIG. 3.—END VIEW OF HOISTING NUT, BUCKLEY ELECTRIC ELEVATOR.

The electric railway of Niagara Falls proper was patronized by this party Sunday afternoon. At one time a crisis presented itself. Ascending the steep grade from the approach to the Devil's Hole the power was not sufficient, and a car load of passengers were filled with trepidation as they viewed the steep incline back of them. The presence of mind of the wise and experienced railroad passenger man asserted itself. Taking from his pocket a rabbit's foot—that had been presented to him by Mr. William Leary, of the New York *Press*, under most pleasant auspices—Mr. Daniels waved it aloft three times three, and lo! and behold! the car started and electricity was again triumphant. No one was unkind enough to notice the sand that had quietly been applied to the slippery track.

Breakfast had been enjoyed at the picturesque Cliff House and lunch at the greatly improved International, and on the return to New York, dinner was served to the congenial party by Mr. John C. Yager, general superintendent of the Wagner Palace Car Company, who was returning with Mrs. Yager in his private car from a pleasant two days at the Falls. The memory of that private car dinner will linger for many days in the minds and palates of the guests.

The beauties of Niagara Falls have long been unknown. The great Falls are only part. The Park and River electric road now makes it possible for all to come and see in a comprehensive and inexpensive manner, and Mr. Ross Mackenzie, the head of the company, is to be congratulated on his management. Another feature of Niagara Falls is the complete breaking up of the robber hackmen—due to the efforts of the New York Central road. One responsible company, Miller & Brundage, now handle this business, and it is well and satisfactorily done.

LITERARY.

Volume XI of the Proceedings of the American Institute of Electrical Engineers has been received.

We have received the ninth biennial report of the Board of Directors of the Kansas State Historical Society.

The fourth annual register, 1894–1895, of Leland Stanford Junior University has been received. There are 78 students credited to the course in electrical engineering.

Mr. A. B. Hepburn, president of the Third National Bank of New York, has written for the August number of *The Forum* an article fully explaining the operations of the "Bond Syndicate," pointing out the excellent results which have followed its work.

Theodore Roosevelt, president of the New York Police Board, has summarized his recent notable career in the federal service under the title, "Six Years of Civil Service Reform." The paper will appear in *Scribner's* for August, and is full of the frank and forcible speaking for which its author is noted.

"Municipal Ownership: Its Fallacy," by M. J. Francisco, ex-president of the National Electric Light Association, has just been revised and published in a fourth edition by the author. It is a compendium of valuable information on the subject and forms a means of basing a logical opinion against the municipal ownership of electric lighting plants.

The first of a series of new Zenda stories by Anthony Hope, author of "The Prisoner of Zenda," will appear in the August number of *McClure's Magazine*. There will be six of these stories, each complete in itself, but all having to do with the charming Princess of Zenda, Osra, and published under the general title of "The Heart of the Princess Osra."

"Outline of the Infringement of Patents for Inventions, Not Designs," by Thomas B. Hall, of the Cleveland bar. Cloth, 86 pp.; price, $1. Sent postage free on receipt of price by the ELECTRICAL REVIEW Publishing Company, 13 Park Row, New York.

The object of this work is to provide an outline of the doctrine touching infringement of patents for inventions, not designs, that is now settled by our tribunal of last resort; such outline to be adapted for inventors, manufacturers and others directly affected by our useful-art law, as well as for law counselors and patent solicitors. No pains have been spared to make it true with the high views on the intricate subject that it assumes to represent; comprehending every fixed point in, and citing under 35 divisions, all cases of the Supreme Court of the United States, thereon, down to April 20, 1895.

"Domestic Electrical Work," by William A. Wittbecker; 55 pages, 22 illustrations. Paper, 25 cents; cloth, 50 cents. Sent postage free on receipt of price by the ELECTRICAL REVIEW Publishing Company, 13 Park Row, New York.

The growing demand for simple electrical apparatus in dwelling houses, offices and workshops, and the need of plain instructions whereby any person without a previous knowledge of electricity may be enabled to undertake their successful installation, has prompted the publication of this little book. It is not intended for the amateur who seeks for nothing but experimental work, neither is it expected to enlighten the expert electrician; but to the person who is seeking for information that will assist him in increasing his daily earnings this little volume is addressed. The information given is above all else practical, and with a close observance of the directions laid down any one without the slightest knowledge of electricity should be able to do the work described.

Dr. Wellington Adams's Railway Company Has Lost Even Its Address.

There is a "To Let" sign in the offices of the Chicago & St. Louis Electric Railway Company in the Women's Temple, Chicago. The company's only known address now is care of the general delivery, St. Louis, Mo. This address is said to be insufficient to satisfy numerous Chicago creditors.

Readers of the ELECTRICAL REVIEW will remember that the company, which was boomed by Dr. Wellington Adams, was to build an air-line electric road between Chicago and St. Louis in time for the World's Fair traffic to be served. A speed of 100 miles an hour was to be made, besides yearly earnings of nearly $3,000,000 and 29 per cent dividends. Our readers will also recollect the chilly "calling down" Dr. Adams received gratis from Prof. George Forbes and others when he attempted to exploit his scheme before the New York Electric Club.

Can't Electrocute This Parson!

The Interior Conduit and Insulation Company, of New York city, recently received a letter from a Connecticut clergyman in which he said:

"However incredible it may seem, I have touched and handled with my bare hands with impunity the naked wire through which was running over 40 volts. I add this because ——— ——— says you are like all the others, you cannot believe it possible. In about two weeks we will demonstrate it to you, and then I will preach you a little sermon from the text, 'Oh ye of little faith. Wherefore did'st thou doubt?' And that is Scripture, too."

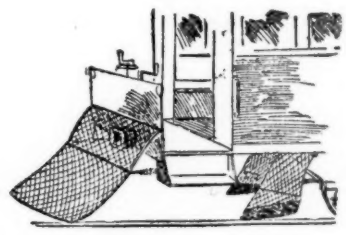
The directors of the Edison Electric Illuminating Company of Boston, on July 15, voted a dividend of one and three-quarters per cent, payable August 1 to stock of record July 15. Books close until August 2. This is an increase in the dividend rate from six per cent to seven per cent per annum.

Fenders for Brooklyn Trolley Cars.

The board of directors of the Brooklyn Heights Railroad Company, of Brooklyn, N. Y., at a meeting on July 16 delegated to President Clinton Rossiter the power to select the safety fenders with which the trolley cars are to be equipped. Mr. Rossiter has already ordered 10 fenders, and if they come up to his expectations he will immediately begin the work of equipping all the cars of the system.

The design selected is that of the Crawford Fender Company, of Philadelphia. It is a sloping fender, hooding the buffer on the front of the car and extending from a point on the dashboard down to within a few inches of the track. The frame is of piping, and its downward line undulates slightly. The fender will be of netting.

At the point of juncture with the dashboard it is hung on a pivot, and half way down is a supporting spiral spring, holding it out from the platform. The contact of a body with the framework causes a compression of the supporting spring, and the tip of the fender sinks to the track.



FENDER FOR BROOKLYN TROLLEY CARS.

Should anything pass under the fender it will meet with a firm wheel guard. The frame of the guard is of rubber and is triangular. It is held out from the wheel truck by a spiral spring, but the frame is so close to the track that nothing can get under it. The fender is adjustable.

Some Battery Questions.

TO THE EDITOR OF ELECTRICAL REVIEW:

Kindly let me know through your paper if a small one-tenth horse-power motor can be run with an electro-motive force of two volts. I am making a small battery for household use, but I prefer to have only *one cell* of primary battery as so many cells (two or more) are impracticable, owing to so many connections, plates, etc. Please state if a potential of two volts, and say 40 or 45 amperes, could be economically utilized in a suitably wound motor of low resistance.

Also state what *proportion* of loss would the employment of such a low potential entail, if any, over the employment of a less current (in amperes) and greater potential—say of 10 volts and eight amperes.

I find that the handling of even two cells is too much for the average person to take care of, amalgamating the zincs, etc.

Yours truly,

J. R. P., Jr.

Chicago, July 16.

ELECTRIC RAILWAY NOTES.

An electric street railway is now in process of construction in Rome, the contracts for which are held by Americans.

The West End Street Railway Company, of Boston, carried an average of 600,000 passengers per day week before last, the largest business ever handled by the road in a single week.

The Louisville Railway Company, of which Mr. T. J. Minary is general manager, operates 140 miles of line in Louisville, Ky. The company did a good business on July 4, carrying 116,414 passengers.

There are now over 500 street railway corporations in the State of Pennsylvania, where eight years ago there were only about 60. The remarkable increase is due almost entirely to the adoption of electricity as a motive power.

The New York, New Haven & Hartford Railroad has filed in the Superior Court an application for an injunction restraining the Central Electric and Tramway Company, of New Britain, from extending its tracks to Hartford, Conn.

Western railroads tributary to Chicago are figuring on a change of motive power to electricity. The Northern Pacific has let contracts for this change as respects suburban traffic. The Illinois Central, which has the heaviest suburban traffic, will ere long change to electricity in order to reduce operating expenses.

The Salt Lake City Railroad Company, of Salt Lake City, Utah, operates a total trackage, both single and double, of 42 miles, over an area of 29 miles. On the Fourth of July this company carried 26,212 passengers. The officers of the company are A. W. McCune, president; R. C. Chambers, vice-president; W. P. Read, superintendent, and Joseph S. Wells, secretary and treasurer.

The Terre Haute Electric Railway Company, of which Russell B. Harrison is president, operates 20 miles of track in Terre Haute, Ind., which has a population of 40,000. On July 4 the company carried 45,500 people, which is 5,500 more than the total population of the city. This apparent anomally can only be explained by the fact that the majority of Terre Haute's citizens rode two or three times, or else all their country relatives were spending the day with them and rode on the electric cars.

A company has been formed to build a trolley line from the Highland Avenue station of the Delaware, Lackawanna & Western Railroad over the Orange Mountain to St. Cloud, N. J. The majority of the stockholders in the company own property along the proposed route. The line will be a direct one to the top of the mountain, and on no part of the route will the grade be very steep. These officers have been elected: President, John Davis; vice-president, Franz Berg; secretary and treasurer, Robert D. Collins. The company is known as the Freeman Street Improvement Company.

SHALL INDEPENDENT TELEPHONE COMPANIES ORGANIZE?

THE QUESTION INTERESTINGLY PRESENTED BY MR. MINNIS, OF THE HOME TELEPHONE COMPANY, OF MOBILE.

TO THE EDITOR OF ELECTRICAL REVIEW:

I note that, at the recent meeting of the Telephone Protective Association, held at Pittsburgh, when Mr. Hammill, secretary of the Ohio Telephone Exchange Company, made a proposition for a joint meeting of the new organization and all the independent telephone companies operating throughout the country, the association concluded that "all the purposes and objects sought by the proposed national association of exchange companies could best be attained through membership in the Protective Telephone Association." Invitation was therefore extended to all such companies to become members.

Now, with all due deference to this consensus of opinion from such a representative body of manufacturers, I must take issue with them on the proposition therein laid down. Let us see if "all the purposes and objects sought by the proposed national association of exchange companies" can "best be attained through membership in the Protective Telephone Association."

First, let us examine into the constituency of these "purposes and objects." What are they? and what are the "purposes and objects" of the Protective Telephone Association?

Mr. Hammill defines the purposes and objects of the proposed National Association as being "To combine the interests of all the independent telephone companies throughout the United States for the betterment of the telephone service, long-distance telephone lines and for the mutual protection of the users of telephones."

Let us look at these purposes and objects in detail and see whether or not the manufacturers' interests and those of the companies are identical "for the betterment of the telephone service." Every manufacturer in the country is now and always will be earnestly engaged in a laudable effort to prove that the best way to "better" the telephone service is to use his appliances. One of them will contend that his instruments are more powerful than others and therefore will "talk through" induction, etc.; another will press forward with a switchboard that will save the expense of two or three girls, etc.; and so on *ad infinitum et ad nauseam*. Cannot these questions be best settled by the companies using telephones, switchboards, etc.? Their interests are common *inter se*, but not with those of the manufacturers, nor are the interests of the individual manufacturers common, one with the other, in this regard. The next purpose is "long-distance telephone lines;" "a consummation most devoutly to be wished;" but would it be wise to put a rider on the proposition in the shape of a manufacturers' association? If there is to be opposition to the Bell company in the long-distance field, it must come in one of two directions; either through an alliance between the independent exchanges and one of the telegraph companies, or by some plan of action arranged between the independent exchanges that will provide for the building of independent long-distance lines.

So far as the first proposition is concerned, the way thereto is at present very much choked up with underbrush. The Western Union is yet twin sister to the Bell company, and it is more than probable that those astute managers who have succeeded

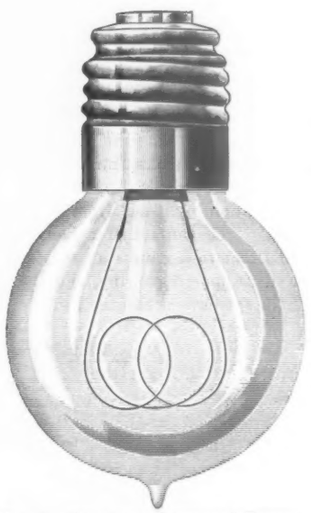


FIG. 1.—BUCKEYE "IMPERIAL" DECORATIVE LAMP.

in earning such fabulous dividends for the stockholders of the Bell monopoly and covering them up by the issue of stock and bonds until every telephone in the country carries over thirteen hundred dollars of "paper," will hesitate a long time before they break an entente and thus force their quondam ally into the field against them. The Postal does not appear to be especially interested in the telephone question just now, although the head officials of the company, in common with those of the Western Union, have of late been engaged in having tests and experiments made in the telephone field.

The other possible way by which the independent exchanges may secure long-distance lines is one that is fraught with many dangers. The first step toward amalgamation is concentration of effort, which produces communion of interests and makes consolidation therefore desirable. This is the one great "bugbear" of the small exchanges. They are afraid, even, of their "stronger brothers." How much more so will (and should) they be of the nightmare of a greedy manufacturer, whose every prayer is—monopoly? Yet, the proposition is to bring in *all* the manufacturers.

The last clause of Mr. Hammill's definition is "for the mutual protection of the *users* of telephones, etc." It is hardly necessary to offer argument on this point, as it is a self-evident fact that it is the *manufacturer* against whom the *user* desires and needs protection.

On the other hand, let us see what community of interest between the *user* and the *manufacturer* is shown by the constitution of the Protective Telephone Association. This document defines the "purposes and objects" of the association as being "mutual protection from unjust legal and other attacks by owners of alleged telephone and cognate patents tending to impair the lawful business of members of this association; to discourage litigation between members of this association by providing methods of arbitration." As to the first proposition: I fail to see any reason why the *users* of telephones, who are supposed to buy them from the *manufacturers* under guarantee against infringement, should place themselves in a position to be assessed for the purpose of defending that guarantee against attack. Nor do I see what interest the *users* of telephones can have in the settlement of differences arising between manufacturers. The only point that might be made on this clause would be that, in case a difference should arise between a *user* and a *manufacturer*, it would be the policy of the association to promote arbitration as a means of settlement, and this would appear to an advantage too small to justify the users in obligating themselves to aid in defraying the expense of litigation between manufacturers who are comembers of the association and manufacturers who are not.

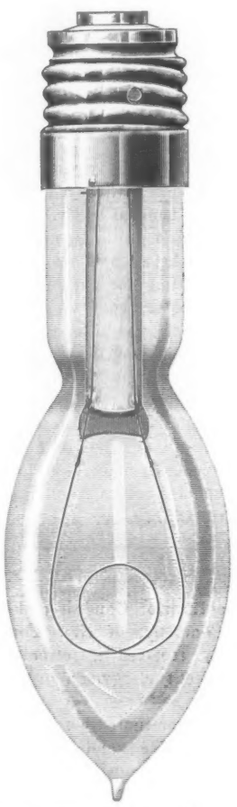


FIG. 2.—BUCKEYE LONG "CANDLE-FLAME" LAMP.

In short, while both the independent manufacturers and the independent users have a *community of purpose* in that they are equally arrayed in opposition to the Bell and Western electric companies, I fail to see wherein they hold a *community of interest* in a degree that would warrant coalition. The amalgamation of either may, and, in all probability, will, if achieved, be productive of satisfactory results, but a combination of both will unquestionably involve a gathering together of opposing interests that no one but an Altrurian can contemplate without the greatest forebodings.

I hope that Mr. Hammill will pursue his original plan and continue to agitate the question until it results in at least a convention of all the independent *users* in the country. I would like to hear from other users and also from the ELECTRICAL REVIEW and other journals of the trade; and I will also be pleased to correspond with any telephone men who may be interested in the furtherance of such a project.

Respectfully,

PAUL MINNIS,

General Manager Home Telephone Company.

Mobile, Ala., July 14, 1895.

Reheating Molten Steel by Electricity.

A press dispatch states that the Carnegie Steel Company at Homestead, Pa., on July 17 tested a new plan which Manager Schwab and Chief Electrician Kinkey have evolved for reheating molten metal that has become chilled before it can be poured into the moulds, causing delay and loss. The new plan largely consists in running through the mass an electric current, by which an intense heat is generated. The molten steel was set to bubbling, and the light and heat was so intense that the workmen's eyes seriously suffered, but at the next test they will wear glasses. The experiment was largely successful, and the results promise to become indispensable in the manufacture of steel.

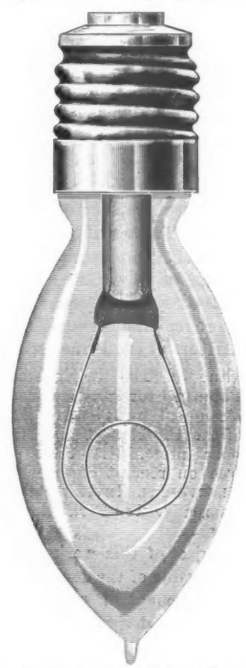


FIG. 3.—BUCKEYE SHORT "CANDLE-FLAME" LAMP.

The Ohm and the Ampere Hour.

To the Editor of Electrical Review:

If not intruding on your valuable time, would you kindly enlighten me as to the meaning of the word ohm? What constitutes an ohm? Is it equivalent to so many feet? We say a 20-ohm instrument; does that mean it has to be wound with so many feet of wire; and also what constitutes an ampere hour? A battery has a capacity of 50-ampere hours; what equivalent is an ampere hour to our standard hour? By answering, you will greatly oblige, Yours respectfully,

John C. Byrnes.

New York, July 10, 1895.

(These terms express units of electrical measurement. Ohm expresses a quantity of resistance to flow of current and is the amount of resistance which would have to be traversed by a current having an electro-motive force behind it of one volt to develop a strength of one ampere; it is practically determined by a conductor of a definite length. The International Congress of Electricians at a meeting held in Chicago in 1893 adopted a standard which has since been legalized by the Congress of the United States and ratified by the President and which has, therefore, become a part of our legal standard of weights and measures. This standard defines an ohm to be: The resistance offered to an unvarying electric current by a column of mercury at the temperature of melting ice, $14\frac{4521}{10000}$ grammes in mass, of a constant cross-sectional area, and of the length of $106\frac{3}{10}$ centimeters. Resistance varies with temperature; hence the necessity of this elaborate definition.

An ampere-hour is one hour's flow of one ampere of current, an ampere being that strength developed by one volt against one ohm.)

Mr. Perry Has Cheerful Views on the Business Outlook.

Mr. D. P. Perry, general manager of the Standard Electric Company, of Chicago, expressed himself last week to a Chicago *Tribune* financial writer, in part, as follows:

The outlook for a golden harvest for the larger manufacturing companies was never better than it is to-day. The daily reports from our traveling men, local correspondents and customers all comment on the bright outlook, and the cheerful and healthy tone pervading nearly every line of industry in nearly every community, whether in the West or the South. Our correspondents lay especial stress on the plans that are being laid, or for work already contracted for, in the line of improvements and extensions by individuals and private corporations as well as public corporations. I do not recall a year in which so many and so large appropriations have been made for all municipal improvements of every character, from electric lighting plants to bridge building, and from street paving to extensions of water plants. Much of this is due not only to the improved commercial conditions that naturally follow a restoration of confidence, but also the prospects of abundant crops. Commercial travelers alone are not optimistic in this respect. That is clearly shown by the recent action of the president of one of the largest railway systems in placing orders for an increase in rolling stock in order the better to be prepared to meet the demand for transportation, not only of grain but for that for which grain will be exchanged.

Another Electric Road for Long Branch.

A press dispatch from Long Branch, N. J., on July 18, states that the Atlantic Coast Electric Railroad is an accomplished fact now. The cars are all ready at Asbury Park waiting for the line to be finished, which, it is promised, will be next week. The terms on which the franchise is granted are that the trolley company shall pave Second avenue, Long Branch, with vitrified brick and shall give the city one per cent of the receipts. A bid for another franchise has now been made. This offers for Second or Third avenue and any streets turning at right angles to same, to the city limits, west, $5,000 per annum, the company to gravel the streets as used. This proposition says: "Our road will be of more advantage to your city than any other talked of or projected line. From your western boundary it will run in a direct line to Asbury Park, passing through West Long Branch, Oceanville, Interlaken, connecting with the Belmar road now in operation, thence on to Sea Girt and Point Pleasant. To the north it will connect with Red Bank, passing through Eatontown, Shrewsbury, Red Bank, and so on to Atlantic Highlands with a branch from Eatontown to Freehold and other towns in that vicinity."

A prominent Boston broker was quoted last week as saying that Bell telephone rights were selling at five cents, two cents of which obligated the seller to subscribe to new shares.

Buckeye Incandescent Lamp Specialties.

The illustrations on this and the preceding pages show special forms of the well-known Buckeye incandescent lamp which is being manufactured by the Buckeye Electric Company, Cuyahoga Building, Cleveland, O.

Fig. 1 illustrates the "Imperial" Buckeye decorative lamp made in all mountings, frosted and plain or in dipped colors—blue, green, ruby, amber.

The voltages run from 48 to 130 for eight and 16 candle-power sizes. A long "candle-flame" Buckeye ornamental lamp is shown in Fig. 2. It is furnished frosted, opal or plain in all mountings for low voltages at 10 candle-power. Fig. 3 shows a short "candle-flame" lamp similar to Fig. 2. A lamp especially adapted for use in breweries and distilleries is the "bunghole" Buckeye lamp illustrated in Fig. 4. It is made in all mountings for low voltages at 10 candle-power, and for high voltages at 16 candle-power, and can be supplied either frosted, opal or plain. A pretty ornamental lamp is the "pineapple" shown in Fig. 5. It is made in voltages from 48 to 130 and eight and 16 candle-power. It is supplied either frosted or plain.

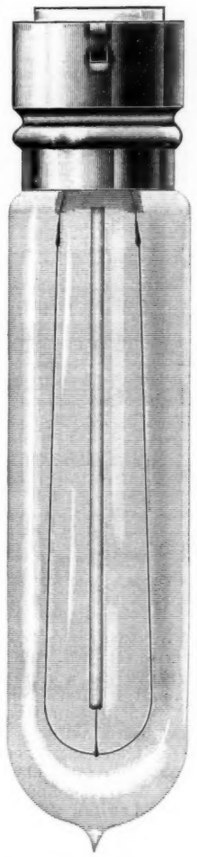


Fig. 4.—Buckeye "Bunghole" Lamp.

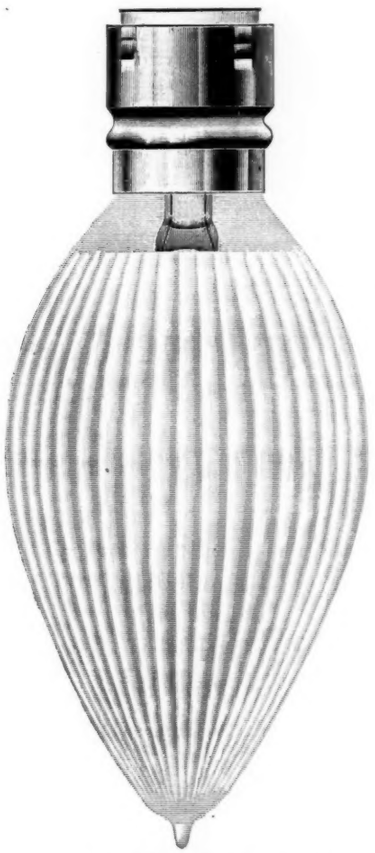


Fig. 5.—Buckeye "Pineapple" Ornamental Lamp.

A robber got away with $2 from the telephone office at New Rochelle, N. Y., early in the morning of July 18. He asked Night Clerk Hoffman to call up some one in New York, and when Hoffman turned toward the switchboard he struck him with a revolver, knocking him senseless.

Westinghouse Company's Annual Meeting.

Exhibition of the Company's Conduit Railway.

The ninth annual meeting of the stockholders of the Westinghouse Electric and Manufacturing Company was held on July 17 at the company's new plant in East Pittsburgh, Pa. The representation was large, 119,000 votes being cast. The company's annual report was published in full in the Electrical Review for July 10, 1895. The following board of directors was elected: Charles Francis Adams, Brayton Ives, George Westinghouse, Jr., A. M. Byers, N. W. Bumstead, Lemuel Bannister, George W. Hebard, August Belmont, Marcellus Hartley and Harry B. Hyde. The board will organize by the re-election of the old officers.

A large number of railroad men and others inspected the Westinghouse conduit electric railway now in operation at the East Pittsburgh shops. This system was illustrated and described in the Electrical Review for June 26, 1895. At the test one motor ran five cars, containing 150 tons of freight, over an intricate system of track, which composes the terminal and yard system of the Westinghouse works, at a good rate of speed handily and easily.

Moonlight Schedule for the United States.

[*Issued by the National Carbon Company.*]

August, 1895.

Day of Mo.	Light.	Day of Mo.	Extinguish.	No. of Hours.
	H.M.		H.M.	H.M.
1	P. M. 11.40	..	.....	4.20
2	.....	2	A. M. 4.00	
3	A. M. 12.40	3	" 4.00	3.20
4	" 1.40	4	" 4.00	2.20
5	No light.	5	No light.	....
6	No light.	6	No light.	....
7	No light.	7	No light.	....
8	P. M. 7.30	8	P. M. 9.30	2.00
9	" 7.30	9	" 9.50	2.20
10	" 7.30	10	" 10.10	2.40
11	" 7.30	11	" 10.30	3.00
12	" 7.30	12	" 11.00	3.30
13	" 7.30	13	" 11.30	4.00
14	" 7.30	15	A. M. 12.20	4.50
15	" 7.30	16	" 1.00	5.30
16	" 7.30	17	" 1.10	5.40
17	" 7.30	18	" 2.10	6.40
18	" 7.30	19	" 3.30	8.00
19	" 7.20	20	" 4.30	9.10
20	" 7.20	21	" 4.30	9.10
21	" 7.30	22	" 4.30	9.10
22	" 7.20	23	" 4.30	9.10
23	" 7.00	24	" 4.30	9.30
24	" 7.00	25	" 4.30	9.30
25	" 8.00	26	" 4.30	8.30
26	" 9.00	27	" 4.30	7.30
27	" 9.40	28	" 4.30	6.50
28	" 10.40	29	" 4.30	5.50
29	" 11.00	30	" 4.30	5.30
30	" 11.30	..	.....	5.00
31	.....	Sept. 1	" 4.30	
	Total			153.00

Stray Dogs to be Electrocuted.

Hereafter all stray dogs caught in Brantford, Ont., will be electrocuted. The victim is fitted with four leather boots, with metallic soles; a piece of wet sponge is fitted in the interior of the boot, and a copper wire connected with the street lighting system is attached to the metallic soles. A policeman holds the dog by a rope around the neck, and a fireman acts as executioner. A switch in the fire hall is turned on, giving a current of 1,700 volts.

The Worcester, Mass., Electric Light Company will install a new 800 horse-power engine, making a total capacity of 800 horse-power.

LONG-DISTANCE TRANSMISSION AT TEN THOUSAND VOLTS—THE POMONA PLANT.

READ BEFORE THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, NIAGARA FALLS, N. Y., JUNE 27, 1895, BY GEORGE HERBERT WINSLOW.

(Continued from page 39.)

The power house is 66 feet long by 30 feet wide, and has walls 12½ feet high. The walls, which are of concrete, were all built by tamping concrete in a space between temporary wooden walls forming a mould, a few feet of wall being built at a time, and the planks then loosened and raised to the height of the next section, the walls being thus made at the least expense for timber. The best English Portland cement was used. The walls were consolidated and cement saved by the use of well washed fragments of rock imbedded in the concrete. In order to obtain the greatest available fall the power house was placed as far as possible below the level of the fall. This necessitated blasting into the side of the hill so far that the entire wall next the hill was below the level of the adjoining rock. The wall was built against the rock, and consequently became damp as soon as the rainy season set in, but this did not effect the 10,000-volt bank of transformers set on a rack beside the wall.

The station was built to accommodate four 120-kilowatt 7,200-alternation 12-pole single-phase Westinghouse alternators, with their full complement of raising transformers and switchboard apparatus, and two exciters. The first installation consisted of one generator with one 90-ampere 125-volt "I" exciter, capable of exciting the four alternators, and of 126-kilowatt capacity of oil transformers in 21 units of six kilowatts, one of these units being kept as a reserve.

Several different methods of connecting the raising and lowering transformers were given careful consideration, the test of actual use favoring a series connection for both primary and secondary coils of both sets of transformers, a plan which has proved to be thoroughly reliable in its practical operation at the Westinghouse plant at Portland,

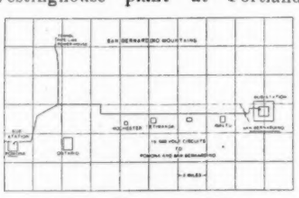


FIG. 4.—ROUTE OF LINES.

Oregon. It was, however, decided, in order to be able to change the initial pressure on the line in case of accident to any of the converters, to connect the primary coils of the raising transformers in multiple to the dynamo, put the line coils all in series with the line and with a similar set of coils in the lowering transformers and connect the other coils of the latter in multiple to the distributing circuits.

The next question was what size of transformer should be used. Many small transformers meant less cost per unit for repairs, greater facility of handling and greater flexibility in case it were desired to change the voltage on the line. Their use, however, also meant greater first cost, more complication and somewhat lower efficiency, but these points were outweighed by the former and a transformer unit of six kilowatts was chosen. Each transformer is contained in a cast-iron box provided with vertical outside ribs, which serve to stiffen it and also to cool the oil with which the box is filled and which entirely covers the transformer. The box is covered by a cast-iron lid, which has conducting and radiating ribs both outside and in, the inner ones dipping into the oil at its hottest part and helping to cool it. The oil, when heated, rises through open spaces around the coils and spreads out in all directions, guided by the ribs on the lids and sinks slowly down between the core and the sides of the box, thus having ample opportunity to become cooled. Each box is provided with a pet cock at the bottom, by which to draw off the bottom layer or oil, should it become too thick for evaporation. It also has an oil gauge to show whether the tops of the coils are completely covered without having to raise the lid. The boxes are supported upon a substantial timber frame, upon the top of which two iron bands serve incidentally to protect the wood, but chiefly to metallically connect the boxes to each other and to the earth, in order to dissipate the static charge received by the boxes, which is very unpleasant. The core of the transformer is connected to the box by a copper strip fastened around a block of wood upon which the core rests in the box, and to provide against the danger which would result from accidental connection between the primary and secondary coils, an insulated sheet of copper is placed between the latter and close to the dynamo coil, and is connected to the core by a tongue which is stuck between the plates.

The line coil, of No. 7 Brown & Sharpe gauge wire, is inside the dynamo coil, and is kept everywhere at a distance of one-half inch from latter, the ground plate. and the core by walnut blocks boiled in paraffine, between which ample openings are left for circulation of the oil. The ratio of transformation is 1,000 to 450, so that in a bank of 20 transformers the dynamo pressure required for 10,000 volts, and on open circuit, is 1,110 volts and on full load about three per cent more than this, or 1,140 volts. The space between the 1,000-volt coil and the core is one-eighth of an inch. The terminals of the line coils are brought up through the oil in mica-fiber tubes passing through heavy glass bushings held in paraffined wooden blocks which are attached to the sides of the boxes. The 1,000-volt terminals are similarly supported, but without glass bushings. The transformers are all connected in multiple to the dynamo circuit, which is supported directly above them on a light pine framework, which also supports the fuse blocks. The latter are single-pole and the fuse passes through a hole in a marble block, the object of so confining the arc being to blow it out by its own force. Only one fuse is used on each transformer. The secondary or line coils are all connected in series by U-shaped insulated wire connections which may be readily detached when making periodical tests for insulation of terminals, and which are entirely independent of the framework supporting the dynamo circuit. Accidental contact with the exposed connectors is prevented by the framework above mentioned, and there is an inflexible rule that the high-tension side of the transformers shall not be touched under any circumstances whatever, while the dynamo is running.

Clark's insulation is used on all wires connected to the transformers and to the dynamo, and the terminal wires of the full bank, which must often be disconnected for testing, are further insulated by heavy glass tubes at points where they might come in contact with other wires. All other transformer wires are supported upon double petticoat glass insulators, and all dynamo wires upon porcelain knobs.

The switchboard is of narrow redwood boards, tongued, grooved and beaded, nailed on a framework of yellow pine, the latter supported on porcelain insulators to keep it dry. The switchboard outfit for the one generator and one exciter consists of two 120-ampere fuse blocks, field rheostat with a 25-ampere dynamo pressure, field switch with fuses, one 150-ampere ammeter and a 200-ampere dynamo pressure jaw switch. From this switch the current passes to two four-dynamo marble switch panels which are connected in multiple to the dynamo, and are each provided with two pairs of contact plugs. By means of these panels and of the two 200-ampere dynamo changing switches below them any feeder can be operated from any dynamo which is connected to the switch panels. Between each panel and its switch is a pair of 65-ampere Wurts shunt wire fuse blocks, each provided with an extra fuse and shunt which can be connected by inserting a plug should it be desired to double the fuses during the run, on account of overload or of weakness in the fuse. The remaining instruments on each feeder are a voltmeter, a No. 1 switchboard converter and a 150-ampere type "E" compensator. When both feeders were run from one alternator, one voltmeter was connected to the generator and the other to the feeder, and in this way the amount of compensation could be watched.

The oil transformers were tested before shipment with 20,000 volts between the line coil and the core and were then taken out of the oil and boxed. In order to expel any moisture which might have been absorbed by the insulation of the coils or have condensed on the cores during their long journey, the transformers were connected in two banks of 10 each, the line coils of each set being connected in series to the generator, which was run at a reduced speed, and the secondary coils each short-circuited on itself. The coils were thus gradually heated to a point somewhat above the boiling point of water, which at that elevation was about 201 degrees Fahrenheit. They were kept at this temperature for a short time and then paraffine oil of a special grade ("Diamond") was poured slowly into the boxes at the edges so that the coils would begin to absorb oil at their lower ends, and thus drive upward the air and volatile gases occluded by the insulation. The transformers were then again brought to their former temperature,

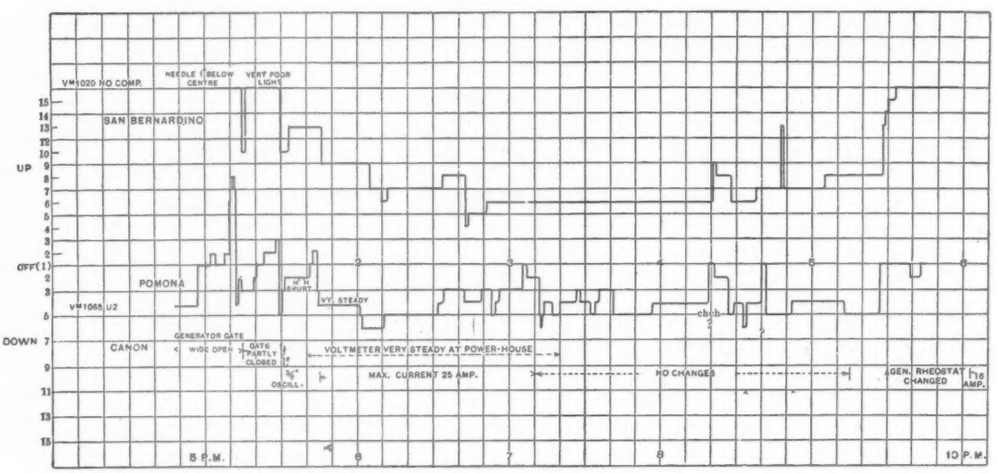


FIG. 5.—RECORD OF SUNDAY, JANUARY 22, 1893, FOR POMONA, SAN BERNARDINO AND CANON.

which caused expansion and partial expulsion of the air remaining in the insulation. Some of the air would, however, collect under the insulation at the top of the coils, and had to be freed by mechanical agitation, produced by stirring the folds of insulation or by pounding on the boxes. The heat caused volatilization of some of the lighter elements of the oil, these coming to the surface as bubbles, just as the air did at first, and the agitation was kept up at intervals until bubbles from this cause also were entirely eliminated.

The 20 transformers then connected as they would be when in regular use, and the two terminals of the line coils, which were to give 10,000 volts, were connected in series with one hundred 100-volt lamps, which were then brought to full candle-power, showing that the transformers were all in good condition. A similar test was then made at Pomona at the end of the 14-mile transmission line running to that place, after which the transformers there were prepared for work in the same way as at the power house, except that the grouping and initial voltage were changed.

There are two transmission lines, one 13¾ miles long, which supplies Pomona, and another 28¾ miles long, which supplies San Bernardino. Each line consists of two No. 7 Brown & Sharpe gauge wires. The joints in the wire are made with McIntire connectors. To further improve the joint the ends of the wires were bent back side by side and soldered together. After the Pomona line was completed and the first 10 miles of the San Bernardino line was

put up, the supply of connectors ran out, and the regular telegraph joint was substituted. The conductivity was assured by soldering as before. (See Fig. 4.)

The wires are supported upon large double petticoat flint glass insulators designed for this plant. These insulators are of perfectly clear flint glass, which gives a better surface insulation than is attainable with any other kind of glass.

It was at first proposed to use oil insulators. The reason they were not used was because the glass companies which had undertaken to furnish them found on trial that they could not make them without considerable experimenting, which would have delayed the installation of the plant. This was no doubt fortunate, as the country through which the line passes is subjected to hot, dry winds which not only blow dust on to the insulators, but also inside them, and during the day the sun beats on the insulators until they become so hot that they nearly blister one's hands. If oil were used under these conditions it would soon evaporate and thicken, and become filled with dust. It would, therefore, seem undesirable to have used oil insulators in this case, or to use them in any other until an increased voltage makes them necessary, and the transmission of greater amounts of energy over the circuits justifies the additional expense necessary to keep the insulators in good condition.

The inside pair of pins was used for the circuit to Pomona and the outside pair for that to San Bernardino, until after the acceptance of the plant, but in anticipation of the installation of another generator the Pomona circuit was changed to the right-hand pair of pins, and the San Bernardino circuit to the left-hand pair, to avoid the fluctuation in lights which would result from inductive interference between two independent circuits.

Commercial lighting in Pomona was begun November 28, 1892, and a telegraphic order was at once sent for another set of reducing transformers, to be used at San Bernardino, where the local circuits were already nearly completed. It was a condition of the franchise for the latter place that lighting should be begun before January 1, and work was pushed rapidly on the transmission line, over 28 miles long, until it was finished. The order for transformers had, however, been given too late for them to be delivered in time and it was decided to reduce the pressure at Pomona to 5,000 volts and to take to San Bernardino the half of the Pomona bank thus made available. In order to avoid the re-heating which would have been required had the transformers been dismounted for shipment, the latter were hauled to San Bernardino on wagons without springs, after the lids had been packed so that the oil could not splash out. The transformers reached their destination after midnight and the next day, December 31, they were connected to the transmission line for a few moments to see that the latter was all right, after which all the lights on the circuit were thrown on for the night.

When the new transformers arrived they were set up and heated in the same way as the others. The heating was continued night and day, until complete, without interrupting the regular lighting service. The change of both circuits to 10,000 volts was made February 16, 1893.

The sub-stations at Pomona and San Bernardino are small brick buildings, one story high, with flat tin roofs and numerous windows. The Pomona building contains two rooms connected by a door near the switchboard. The front room is used as the office of the company and the other as a transformer room. The 10,000-volt circuit enters over the door and is connected directly to the bank of lowering transformers, no switches or other appliances being used on the high-tension lines either there or at San Bernardino. The switchboard appliances are a Stillwell regulator, two 100-ampere marble fuse blocks, with double plugs and fuses, 100-ampere jaw switch, 150-ampere ammeter, compensating voltmeter, compensator and converter.

The San Bernardino sub-station is longer than that at Pomona and is not divided by a wall. The transformers are placed in a row along a side wall and along part of the end wall next the switchboard. The transformers near the switchboard heat the most. This is probably due to the slight drop in wiring between them and the more distant converters. During the first year of operation a little new oil was put into the converters about every four months to make up for that evaporated, but none of the old oil was drawn off. The switchboard apparatus is like that at Pomona.

The Stillwell regulator has long been recognized as a valuable adjunct to the central station operating a number of feeders of different lengths from a single dynamo. Its utility is still greater in a system of long-distance transmission in which, as was the case in this plant during its first year of operation, the transmission circuits are supplied from one dynamo, since it is not practicable to install such a system so as to operate with small line loss, and, therefore, means must be provided to compensate for the large differences in the pressure at the ends of the lines. The use of regulators at the power house was impossible while but one bank of raising transformers was used for the two circuits. Even when it became possible by the use of separate banks of transformers, it was still undesirable because the attendant at the power house would often have to work both the regulators simultaneously to properly compensate for changes in load, and his attention would be required by the regulators at exactly the time he should be free to attend to the generators and water-wheels. A regulator was therefore placed at each substation, as already stated. These are each of 2,000 lights capacity and have a range of 0 per cent up, and 10 per cent down. This variation of 10 per cent (100 volts) is divided into 14 equal parts, so that each step corresponds to 7.1 volts. The diagram (Fig. 5) is taken from the station records for Sunday, January 22, 1893, and shows the number of changes required during the evening at each station. The line marked "off" is the base line, and the divisions above and below correspond to the steps on the dial and show to what an extent the regulators were used to increase or decrease the pressure. This diagram shows how impossible it would be to furnish lights without using regulators, even on Sunday, when the load is much smaller than on other days.

The distribution from both substations is effected in the usual manner at 1,000 volts for incandescent lighting, the only point of interest being that a considerable number of Helios arc lamps are successfully used on the circuits.

While in use the transformers in the sub-stations give forth a continuous hum which depends for its tone on the number of alternations. This is an excellent indicator for the attendant, whose attention is instantly called to any change in the running conditions of the plant by the resulting change of tone. Its indications not only mark changes which are taking place and which can be detected on the voltmeter, but also give notice of coming changes before there is any other indication of them. It is thus possible to foretell a coming drop in voltage in time to use the regulator and thus keep the voltmeter needle perfectly still, though the voltmeter is a very sensitive instrument and the regulator is often moved four or five notches. The hum often changes, however, without any corresponding movement of the voltmeter, but the sound is then somewhat different. At rare intervals the switchboard lights will suddenly change slightly in candle power before any change is noticeable on the voltmeter.

It is noticeable that the needle will often stand for a time perfectly still on the center, and, on a slight rise in the hum, will start gently rising, never more than three-quarters of an inch, and then as the tone gradually becomes lower, slowly fall back to the center and stop without passing it. At other times the variation in hum is more sudden and the needle will rise and oscillate above the center. Again, the needle will oscillate equally about the center during a regular rise and fall of hum, its movement being apparently due to one impulse and not seeming to be modified by subsequent variations. There is no apparent change in candle-power of the lamps during the voltmeter changes noted. These notes were made while the plant was running at only 5,000 volts, but they were later confirmed when using 10,000 volts. During dry weather there is considerable intermittent oscillation of the voltmeter needle without there being any change in load or any other apparent cause, while in wet weather the needle remains perfectly still for many minutes at a time, often for as much as half an hour. A possible explanation of this oscillation may be found in the presence of static charges on the line, due to atmospheric electricity. That the line is often heavily charged from the air is shown by a number of observations. One afternoon a painful shock was obtained on touching the line at the canon end, drifting clouds and a strong wind being noticed in the valley. Again, while using the telephone a report was heard in it so sharp as to cause momentary deafness. Later, after a moderate wind had been blowing for some time, loud reports were noticed on the telephone at long intervals. As the wind became higher the reports came oftener and the intervals between the reports became shorter. It was evident that there was a discharge from the lines through the telephone, which was on a metallic circuit, and that it depended on the rate at which the wind blew. In order to get the strongest effect the two wires were connected in the usual way to the raising and lowering transformers, and one side of the telephone connected to one wire. On connecting the other side of the telephone to ground a sharp report was heard, and on maintaining the connection there was a sound as of steam escaping at a distance, with intermittent and very faint crackling. If the ground contact was made slowly there was a bright spark before the metals touched and a loud report. If the fingers were interposed a smart shock was received. By making and breaking the ground connection rapidly, the line was prevented from accumulating a heavy charge and no spark was visible, though a faint crack was heard. If a slight space was left between the telephone wire and the ground, a spark occurred at fairly regular intervals, and when the space was lessened the sparks become smaller and more frequent. When the wind lessened the sparks and reports became almost imperceptible, but on the wind becoming strong and blustery a large spark was again obtained. When one line wire was disconnected from the transformers at Pomona the effect obtained from grounding that wire was less owing to the reduction in capacity.

These observations, which were made on the Pomona circuit during hot, dry and cloudless weather, show conclusively that the lines were heavily charged by the action of the wind. The wind, no doubt, blows electrified air and dust against the wires, the latter thereby accumulating a static charge with a rapidity which we have seen depended on the speed of the wind.

(To be continued.)

WEATHER-PROOF TRADE MARK "O.K." LINE AND HOUSE WIRES

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FIRE.

The destruction of our Works by fire on April 7th was almost complete.
We have already resumed manufacturing and are making limited shipments, which are daily increasing.
Send us your orders. We will fill them with reasonable despatch, or advise you promptly if we cannot.

CROCKER-WHEELER ELECTRIC COMPANY,

Manufacturers and Electrical Engineers.

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Sizes up to 250 H. P.

ADVANCE INFORMATION.

VALUABLE INFORMATION FOR MANUFACTURERS AND DEALERS.

We publish below the earliest information obtainable relating to new electric railways, new electric light companies, new telephone companies and projected electric construction of all kinds. Every reader will find these columns of special interest, and manufacturers and supply houses will receive many valuable suggestions looking to new business by carefully watching this department in the ELECTRICAL REVIEW from week to week.

Increase of Capital Stock.

MOUNT VERNON, N. Y.—The North Mount Vernon Surface Railroad Company has voted to increase its capital stock from $20,000 to $250,000 for the purpose of extending its line to Tuckahoe, Bronxville and White Plains. An application will soon be made for a franchise through these towns.

HARTFORD, CONN.—The Perkins Electric Switch Manufacturing Company, of this city, has increased its capital from $50,000 to $125,000.

New Manufacturing Companies.

CAMDEN, N. J.—The Ideal Electric Corporation has been incorporated with a capital stock of $100,000.

NORFOLK, VA.—The Southern Electric Service Company will be organized by William R. Brown, Mr. Hobbs, of Rockland County, N. Y., and several others from New York State. Capital stock, $175,000.

DANVILLE, VA.—The Dan River Power and Manufacturing Company has been granted a charter. Thomas B. Fitzgerald, president; William P. Bethell, vice-president; Roger A. James, secretary and treasurer; and directors, Thomas B. Fitzgerald, W. P. Bethell, R. A. James, J. H. Schoofield and James E. Schoofield. The company has the right to erect electric plants, lease water and electric power and several other things.

New Telephone and Telegraph Companies.

BALTIMORE, MD.—The name of the Writing Telegraph Company has been changed to the Home Telephone and Telegraph Company.

WAYNE, N. Y.—Wayne Telephone and Telegraph Company is being organized with a capital stock of $5,000.

BALTIMORE, MD.—The Chesapeake and Potomac Telephone Company is contemplating the enlargement of the central building, at St. Paul street and Bank lane.

MOODUS, CONN.—A new telephone cable has been laid across the river at Lyme. It is 1,800 feet long and weighs 8,000 pounds.

HILLSBORO, MASS.—Montgomery County Telephone Company has been incorporated with a capital stock of $8,000. Incorporators: Charles A. Ramsey, Jacob Fry, William S. Barry and Geo. W. Huffer.

SUPERIOR, WIS.—The Douglass County Telephone Company has been incorporated by Pear Benson, P. G. Straton, and Russell Baxter to purchase, lease, or otherwise acquire or maintain and operate telephone and telegraph lines. Capital stock, $30,000.

ASTORIA, ILL.—The Astoria Telephone Company has been incorporated by J. A. Windhurst, J. N. Todd, A. J. Baxter, H. J. Farwell, and T. W. Emerson. Capital stock, $2,500.

ALBANY, N. Y.—The Home Standard Telephone Company has been incorporated with a capital stock of $150,000. The directors include ex-Senator Henry Russell, John H. Farrell, C. H. Whitney, W. H. Keeler, John M. Bailey, William McMurtrie Speer, President Howard Hendrickson, of the Common Council; State Committeeman William Barnes, Jr., of the Albany *Journal*; W. N. S. Sanders, Corporation Counsel William P. Rudd, Public Printer James B. Lyon, W. A. Graves, John A. McCarthy and Police Commissioner W. J. Walker.

HUGHES, OHIO.—Hamilton, Hughes & Monroe Telephone Company has been incorporated. Capital stock, $5,000.

Electric Light and Power.

CHATTANOOGA, TENN.—The Chattanooga Light and Power Company will build a new plant in the center of the city at a cost of at least $50,000.

MECHANICSBURG, PA.—The contract for lighting the town has been granted to the C. L. H. & P. Company.

PHILADELPHIA, PA.—A contract for the erection of an electrical disinfecting plant was awarded by the Board of Health to the Excelsior Electric Company.

OREGON, ILL.—The Oregon Electric Light and Power Company has been incorporated by Albert H. Knodle, William L. Taylor and H. L. Allen. Capital stock, $50,000.

COLUMBIA, S. C.—An immense electric plant will be erected, which will furnish motive power for all of the machinery in the city.

LANARK, ILL.—A new electric light building will be constructed.

CHEROKEE, IA.—The Cherokee Electric Light Company will make extensive improvements in the near future.

ESCANABA, MICH.—The city proposes to establish a municipal lighting plant and has offered $70,000 for the light factory there now, controlled by private citizens.

WENONAH, N. J.—The question of lighting the borough with electricity is now being discussed.

BLAIRSTOWN, N. J.—Mr. Charles H. Crisman has received the contract for putting in the electric light plant at this place.

FAIRFIELD, ME.—Steps are being taken toward establishing an electric light system in this town.

HUMBOLDT, TENN.—The citizens of this place voted bonds for waterworks and electric light.

VENTURA, CAL.—It is proposed to issue $130,000 in serial bonds to run 40 years with which to purchase the electric light plant now in use by the Ventura Water and Lighting Company.

CINCINNATI, OHIO.—Arcade Mutual Electric Light Company has been incorporated. Capital stock, $15,000.

EASTON, MD.—The Easton Gas and Electric Light Company will make extensive improvements to its plant.

RALEIGH, N. C.—The State University will put in an electric light plant.

ELMWOOD PLACE, OHIO.—The Waterworks and Electric Light Company will supply the village with water and light power.

New Electric Railways.

FORT WORTH, TEX.—A movement is on foot to run an electric railway line from the city to the Polytechnic College.

IRONTON, OHIO.—The Ironton Street Railway has been sold to R. T. McDonald for $20,000.

NORWICH, N. Y.—There is talk of constructing an electric trolley road between this place and Chenango Lake. The cost of the railroad will be about $25,000.

AMSTERDAM, N. Y.—It is stated that the Amsterdam Street Railroad Company is making preparations to sell the road.

SANTA BARBARA, CAL.—The Santa Barbara Consolidated Electric Company has been incorporated by A. Hope Doeg, S. J. Keese, N. F. Ashton, B. S. Hayne, J. B. McMullen, P. C. Higgins and W. F. Reed to maintain street railways, etc. Capital stock, $200,000.

ALLEGHENY, PA.—The Pittsburgh, Sheraden & Carnegie Traction Company has been incorporated by Harding Kimberland, president; Henry Wenke, Miller Elliott, Richard B. Scandrett and D. K. Ferrell to build an electric line from Allegheny to Washington, Pa. Capital stock, $42,000.

LOCKPORT, N. Y.—It is understood that an electric road from Lockport to Olcott is proposed.

ALBANY, N. Y.—The Edwards Automatic Car Fender Company has been incorporated with a capital of $100,000. The directors are Patrick J. Carlin, Henry W. Rozell, Joseph H. Cuyler, John Barnes, Michael F. McGoldrick, all of this city, and Charles Edwards, of Freeport.

WOODWARD, OKLA.—An electric railway company has been incorporated to build a line from Woodward to Fort Supply, distance 20 miles; capital stock, $200,000. Hon. A. G. Cunningham is president of the company. Work will be commenced in September or October.

CHARLESTON, W. VA.—The Charleston street railway, waterworks, gas plant and electric plant has been purchased by New York capitalists, who will expend $50,000 in immediate improvements.

BALTIMORE, MD.—Mr. John Hubner, director of the Catonsville & Ellicott City Railway has prepared a subscription list for a new electric railway which will run from Franklin road to Wetheredsville, to Cook's Lane, near Bonnie Brae Cemetery.

HARRISBURG, PA.—The Lancaster, Ephrates & Reading Railroad have applied for a charter. Capital stock, $70,000.

ATLANTA, GA.—The Consolidated Street Railway Company are making extensive improvements to its power plant.

NEW ORLEANS, LA.—The Orleans Railroad Company will build a brick power house, boiler room, etc., to have architectural iron works, electric lighting, etc.

ATLANTA, GA.—The Georgia Railway Company has been incorporated by August H. Denning, Thomas Barnes, James H. Gilbert and others. Capital stock, $2,800,000.

REED CITY, MICH.—The Reed City Electric Company has been incorporated by Chares A. Kimmel, Laure Thomas and others. Capital stock, $10,000.

PORT HURON, MICH.—The Port Huron Electric Railway Company is making preparations to extend their lines and increase their service.

BLACK RIVER FALLS, WIS.—The electric railway company has secured a 30 days' option on the water power here. They plan to improve the power extensively and put up a fine plant.

RADNOR, PA.—Radnor Electric Passenger Railway Company has been incorporated; capital, $30,000. Directors: Henry Douglass Hughes, president; Andrew J. Reilly, David Pepper, Jr., T. E. Schermerhorn, Frank H. Hawkins, Lincoln L. Eyre, H. A. Mullen, Philadelphia; Albert Layton Register, Ardmore.

BRIDGEPORT, CONN.—It is said that the Traction company will extend its lines from the present terminus on North avenue to Beardsley Park.

DETROIT, MICH.—John B. Maloney and others have organized a company to operate an electric line between Detroit and Dearborn. Capital stock, $50,000.

NEW YORK, N. Y.—A company proposes to build a new suburban trolley from Mount Vernon to White Plains as a link in the electric railway system.

PITTSBURGH, PA.—The Fort Pitt Street Passenger Railway Company has been incorporated by Joshua Rhodes and others with a capital stock of $50,000.

JACKSONVILLE, FLA.—The Jacksonville Street Railway Company has just added new machinery to its plant.

DE SOTO, MO.—A franchise has been granted St. Louis parties for an electric railway from St. Louis to Morse's Mills.

CINCINNATI, OHIO.—The Cincinnati Street Railway Company will doubtless own and operate the Dayton, Middletown & Cincinnati traction road.

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